

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4048.8948 (211)
Space heating requirement	716.2964	560.3274	470.8101	273.7863	126.9038	0.0000	0.0000	0.0000	0.0000	274.0457	510.3893	731.6909	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	791.4877	619.1463	520.2321	302.5263	140.2252	0.0000	0.0000	0.0000	0.0000	302.8129	563.9661	808.4982	(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	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	(64)
Efficiency of water heater (217)m	89.8802	89.8211	89.7011	89.4280	88.8603	87.3000	87.3000	87.3000	87.3000	89.4020	89.7564	89.9052	(217)
Fuel for water heating, kWh/month	184.6532	162.0387	168.4617	148.7811	144.7652	128.7957	120.9750	136.5069	137.4516	154.4661	166.0616	179.2600	(219)
Water heating fuel used													1832.2167 (219)
Annual totals kWh/year													
Space heating fuel - main system													4048.8948 (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)													353.9840 (232)
Total delivered energy for all uses													6310.0956 (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	4048.8948	0.2160	874.5613	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1832.2167	0.2160	395.7588	(264)
Space and water heating			1270.3201	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	353.9840	0.5190	183.7177	(268)
Total CO2, kg/year			1492.9628	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4600	(273)

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

DER			18.4600	ZC1
Total Floor Area		TFA	80.8800	
Assumed number of occupants		N	2.4793	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.2117	ZC2
CO2 emissions from cooking, equation (L16)			2.2070	ZC3
Total CO2 emissions			36.8787	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			36.8787	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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4017 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 infiltr rate	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			15.0600	1.3258	19.9659		(27)					
150mm B&B			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinium	128.2300	17.0300	111.2000	0.1800	20.0160		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m ²)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		52.4663 (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)							10.3390 (36)					
Total fabric heat loss							(33) + (36) = 62.8053 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	101.6184	101.3783	101.1429	100.0373	99.8305	98.8676	98.8676	98.6892	99.2385	99.8305	100.2489	100.6864 (39)
Average = Sum(39)m / 12 =												100.0364 (39)
HLP	Jan 1.2564	Feb 1.2534	Mar 1.2505	Apr 1.2369	May 1.2343	Jun 1.2224	Jul 1.2224	Aug 1.2202	Sep 1.2270	Oct 1.2343	Nov 1.2395	Dec 1.2449 (40)
HLP (average)												1.2368 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (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												

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Combi 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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Total heat required for water heating calculated for each month	50.9589	45.4150	48.3835	44.9866	44.5887	41.3142	42.6913	44.5887	44.9866	48.3835	48.6590	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	(61)
Solar input	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	(62)
Output from w/h	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	(64)
	63.2284	55.5115	57.6627	50.9729	49.2655	43.2218	41.1532	46.1239	46.6411	53.3447	57.1910	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table b)	84.9845	82.6064	77.5037	70.7957	66.2171	60.0302	55.3135	61.9945	64.7793	71.6998	79.4320	82.8432	(72)
Total internal gains	389.4886	387.1655	372.9521	350.4090	327.5137	305.4367	291.5140	298.1400	310.0355	332.7913	358.8400	378.1414	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	(83)						
Northeast	0.6600	11.2829	0.6300	0.7000	0.7700	2.2758	(75)						
Southeast	3.7100	36.7938	0.6300	0.7000	0.7700	41.7177	(77)						
Southwest	5.3400	36.7938	0.6300	0.7000	0.7700	60.0466	(79)						
Northwest	5.3500	11.2829	0.6300	0.7000	0.7700	18.4479	(81)						
Solar gains	122.4881	215.5261	313.1762	418.6874	496.9379	505.6487	482.3788	422.1193	349.4192	243.1321	147.9660	104.0131	(83)
Total gains	511.9766	602.6916	686.1283	769.0964	824.4516	811.0854	773.8928	720.2593	659.4547	575.9233	506.8060	482.1545	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	55.2721	55.4030	55.5320	56.1457	56.2620	56.8100	56.8100	56.9127	56.5977	56.2620	56.0272	55.7838
alpha	4.6848	4.6935	4.7021	4.7430	4.7508	4.7873	4.7873	4.7942	4.7732	4.7508	4.7351	4.7189	
util living area	0.9975	0.9941	0.9848	0.9542	0.8713	0.7116	0.5459	0.6029	0.8420	0.9720	0.9947	0.9981	(86)
MIT	19.6486	19.8226	20.0982	20.4552	20.7597	20.9363	20.9856	20.9774	20.8517	20.4528	19.9839	19.6185	(87)
Th 2	19.8751	19.8775	19.8798	19.8906	19.8927	19.9021	19.9021	19.9039	19.8985	19.8927	19.8885	19.8843	(88)
util rest of house	0.9966	0.9921	0.9793	0.9367	0.8228	0.6156	0.4179	0.4726	0.7661	0.9579	0.9925	0.9974	(89)
MIT 2	18.0858	18.3410	18.7419	19.2560	19.6589	19.8603	19.8970	19.8948	19.7807	19.2628	18.5849	18.0481	(90)
Living area fraction	18.3909	18.6302	19.0067	19.4901	19.8739	20.0703	20.1095	20.1061	19.9898	19.4952	18.8580	18.3547	(92)
Temperature adjustment	18.3909	18.6302	19.0067	19.4901	19.8739	20.0703	20.1095	20.1061	19.9898	19.4952	18.8580	18.3547	(93)
adjusted MIT	18.3909	18.6302	19.0067	19.4901	19.8739	20.0703	20.1095	20.1061	19.9898	19.4952	18.8580	18.3547	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Utilisation	0.9948	0.9888	0.9734	0.9287	0.8218	0.6315	0.4430	0.4979	0.7734	0.9510	0.9894	0.9960	(94)
Useful gains	509.3109	595.9124	667.8838	714.2329	677.5571	512.2009	342.8261	358.6273	510.0522	547.7133	501.4552	480.2332	(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	1431.0962	1391.9469	1264.9636	1059.4071	815.9997	540.8387	346.9791	365.7569	584.4927	888.0082	1178.7273	1425.1873	(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	686.4035	534.9351	444.2273	248.5254	103.0013	0.0000	0.0000	0.0000	0.0000	253.1794	487.6359	703.0459	(98)
Space heating												3460.9539	(98)
Space heating per m2												42.7912	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													3705.5181 (211)
Space heating requirement	686.4035	534.9351	444.2273	248.5254	103.0013	0.0000	0.0000	0.0000	0.0000	253.1794	487.6359	703.0459	(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)	734.9074	572.7357	475.6181	266.0871	110.2797	0.0000	0.0000	0.0000	0.0000	271.0701	522.0942	752.7258	(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	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	(64)
Efficiency of water heater (217)m	87.8790	87.6451	87.1711	86.0880	83.9857	80.3000	80.3000	80.3000	80.3000	86.0167	87.3879	87.9685	(217)
Fuel for water heating, kWh/month	230.7770	203.3431	212.7156	191.0419	189.5922	174.6465	167.3246	186.5277	188.5877	200.4728	210.6428	225.0958	(219)
Water heating fuel used													2380.7679 (219)
Annual totals kWh/year													
Space heating fuel - main system													3705.5181 (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)													353.9840 (232)
Total delivered energy for all uses													6515.2699 (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	3705.5181	0.2160	800.3919 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2380.7679	0.2160	514.2459 (264)
Space and water heating			1314.6378 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	353.9840	0.5190	183.7177 (268)
Total CO2, kg/m2/year			1537.2805 (272)
Emissions per m2 for space and water heating			16.2542 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2715 (272b)
Emissions per m2 for pumps and fans			0.4813 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2542 * 1.00) + 2.2715 + 0.4813, rounded to 2 d.p.			19.0100 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
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1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (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				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) - Pressure test				30.0000 / (5) =	0.1517 (8)							
Measured/design AP50 Infiltration rate					5.0100							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3419 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4359	0.4273	0.4188	0.3761	0.3675	0.3248	0.3248	0.3162	0.3419	0.3675	0.3846	0.4017 (22b)
Effective ac	0.5950	0.5913	0.5877	0.5707	0.5675	0.5527	0.5527	0.5500	0.5584	0.5675	0.5740	0.5807 (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					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			15.0600	1.3347	20.1009		(27)					
150mm B&B			40.4400	0.1500	6.0660		(28a)					
50mm A. Platinium	128.2300	17.0300	111.2000	0.2700	30.0240		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m2)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 62.6093		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							191.1830 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5069 (36)					
Total fabric heat loss						(33) + (36) =	70.1162 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8285	Feb 38.5878	Mar 38.3518	Apr 37.2435	May 37.0361	Jun 36.0708	Jul 36.0708	Aug 35.8920	Sep 36.4426	Oct 37.0361	Nov 37.4556	Dec 37.8942 (38)
Heat transfer coeff	108.9448	108.7040	108.4681	107.3597	107.1524	106.1870	106.1870	106.0083	106.5589	107.1524	107.5719	108.0104 (39)
Average = Sum(39)m / 12 =												107.3587 (39)
HLP	Jan 1.3470	Feb 1.3440	Mar 1.3411	Apr 1.3274	May 1.3248	Jun 1.3129	Jul 1.3129	Aug 1.3107	Sep 1.3175	Oct 1.3248	Nov 1.3300	Dec 1.3354 (40)
HLP (average)												1.3274 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Designed)

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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	0.0000 (57)
Heat gains from water heating, kWh/month	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 (59)
	32.2672	28.2211	29.1217	25.3890	24.3613	21.0220	19.4799	22.3535	22.6205	26.3620	28.7762	31.2491	(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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	43.3699	41.9957	39.1420	35.2625	32.7437	29.1972	26.1827	30.0451	31.4174	35.4328	39.9669	42.0015	(72)
Total internal gains	344.8740	343.5548	331.5904	311.8757	291.0404	271.6037	259.3833	263.1906	273.6736	293.5242	316.3750	334.2996	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	0.6600	11.2829	0.7100	0.7000	0.7700	2.5648	(75)						
Southeast	3.7100	36.7938	0.7100	0.7000	0.7700	47.0152	(77)						
Southwest	5.3400	36.7938	0.7100	0.7000	0.7700	67.6715	(79)						
Northwest	5.3500	11.2829	0.7100	0.7000	0.7700	20.7905	(81)						
Solar gains	138.0421	242.8945	352.9447	471.8541	560.0411	569.8581	543.6332	475.7218	393.7898	274.0060	166.7554	117.2211	(83)
Total gains	482.9161	586.4493	684.5351	783.7298	851.0815	841.4617	803.0165	738.9124	667.4635	567.5302	483.1303	451.5208	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	39.4259	39.5132	39.5992	40.0080	40.0854	40.4498	40.4498	40.5180	40.3087	40.0854	39.9291	39.7669	21.0000 (85)
tau	3.6284	3.6342	3.6399	3.6672	3.6724	3.6967	3.6967	3.7012	3.6872	3.6724	3.6619	3.6511	
util living area	0.9940	0.9874	0.9721	0.9313	0.8432	0.6963	0.5462	0.6038	0.8230	0.9570	0.9891	0.9953	(86)
MIT	19.1701	19.3990	19.7587	20.2191	20.6172	20.8710	20.9606	20.9429	20.7443	20.2158	19.6049	19.1302	(87)
Th 2	19.8042	19.8065	19.8088	19.8194	19.8214	19.8307	19.8307	19.8325	19.8272	19.8214	19.8174	19.8132	(88)
util rest of house	0.9924	0.9840	0.9641	0.9107	0.7946	0.6038	0.4165	0.4736	0.7501	0.9399	0.9856	0.9940	(89)
MIT 2	18.1512	18.3801	18.7368	19.1902	19.5552	19.7655	19.8189	19.8133	19.6764	19.1973	18.5944	18.1181	(90)
Living area fraction	18.3501	18.5790	18.9363	19.3911	19.7625	19.9813	20.0418	20.0338	19.8849	19.3961	18.7917	18.3157	(92)
MIT	18.3501	18.5790	18.9363	19.3911	19.7625	19.9813	20.0418	20.0338	19.8849	19.3961	18.7917	18.3157	(92)
Temperature adjustment													0.0000
adjusted MIT	18.3501	18.5790	18.9363	19.3911	19.7625	19.9813	20.0418	20.0338	19.8849	19.3961	18.7917	18.3157	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9895	0.9791	0.9564	0.9014	0.7918	0.6169	0.4413	0.4978	0.7543	0.9319	0.9813	0.9917	(94)
Useful gains	477.8642	574.2086	654.7095	706.4530	673.9026	519.0678	354.3461	367.8569	503.4830	528.8667	474.0727	447.7703	(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	1530.6874	1486.9660	1348.9415	1126.3205	863.9188	571.4292	365.4704	385.2158	616.4346	942.5263	1257.6976	1524.6452	(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	783.3005	613.3730	516.5086	302.3046	141.3721	0.0000	0.0000	0.0000	0.0000	307.7628	564.2100	801.1950	(98)
Space heating												4030.0265	(98)
Space heating per m2												(98) / (4) =	49.8272 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	998.1582	785.7842	805.6630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8156	0.8786	0.8489	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	814.1351	690.4094	683.9423	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1076.1409	1029.2951	955.9562	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	188.6442	252.1310	202.3783	0.0000	0.0000	0.0000	0.0000	(104)

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Space cooling											643.1535 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	47.1611	63.0327	50.5946	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											160.7884 (107)
Space cooling per m2											1.9880 (108)
Energy for space heating											49.8272 (99)
Energy for space cooling											1.9880 (108)
Total											51.8152 (109)
Dwelling Fabric Energy Efficiency (DFEE)											51.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.4017 (18)							
Number of sides sheltered				2	(19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			15.0600	1.3258	19.9659		(27)					
150mm B&B			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinium	128.2300	17.0300	111.2000	0.1800	20.0160		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m ²)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 52.4663		(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)							10.3390 (36)					
Total fabric heat loss							(33) + (36) = 62.8053 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	101.6184	101.3783	101.1429	100.0373	99.8305	98.8676	98.8676	98.6892	99.2385	99.8305	100.2489	100.6864 (39)
Average = Sum(39)m / 12 =												100.0364 (39)
HLP	Jan 1.2564	Feb 1.2534	Mar 1.2505	Apr 1.2369	May 1.2343	Jun 1.2224	Jul 1.2224	Aug 1.2202	Sep 1.2270	Oct 1.2343	Nov 1.2395	Dec 1.2449 (40)
HLP (average)												1.2368 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy conte	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Energy content (annual)												Total = Sum(45)m = 1464.5812 (45)
Distribution loss (46)m = 0.15 x (45)m												
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 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	0.0000 (57)
Heat gains from water heating, kWh/month	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 (59)
	32.2672	28.2211	29.1217	25.3890	24.3613	21.0220	19.4799	22.3535	22.6205	26.3620	28.7762	31.2491	(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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	43.3699	41.9957	39.1420	35.2625	32.7437	29.1972	26.1827	30.0451	31.4174	35.4328	39.9669	42.0015	(72)
Total internal gains	344.8740	343.5548	331.5904	311.8757	291.0404	271.6037	259.3833	263.1906	273.6736	293.5242	316.3750	334.2996	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	0.6600	11.2829	0.6300	0.7000	0.7700	2.2758 (75)							
Southeast	3.7100	36.7938	0.6300	0.7000	0.7700	41.7177 (77)							
Southwest	5.3400	36.7938	0.6300	0.7000	0.7700	60.0466 (79)							
Northwest	5.3500	11.2829	0.6300	0.7000	0.7700	18.4479 (81)							
Solar gains	122.4881	215.5261	313.1762	418.6874	496.9379	505.6487	482.3788	422.1193	349.4192	243.1321	147.9660	104.0131	(83)
Total gains	467.3621	559.0809	644.7667	730.5632	787.9782	777.2524	741.7621	685.3099	623.0928	536.6563	464.3410	438.3127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nll,m (see Table 9a)	55.2721	55.4030	55.5320	56.1457	56.2620	56.8100	56.8100	56.9127	56.5977	56.2620	56.0272	55.7838	21.0000 (85)
tau	4.6848	4.6935	4.7021	4.7430	4.7508	4.7873	4.7873	4.7942	4.7732	4.7508	4.7351	4.7189	
util living area	0.9983	0.9957	0.9881	0.9617	0.8863	0.7328	0.5667	0.6282	0.8634	0.9785	0.9963	0.9987	(86)
MIT	19.5984	19.7742	20.0542	20.4195	20.7370	20.9276	20.9832	20.9731	20.8319	20.4132	19.9365	19.5689	(87)
Th 2	19.8751	19.8775	19.8798	19.8906	19.8927	19.9021	19.9021	19.9039	19.8985	19.8927	19.8885	19.8843	(88)
util rest of house	0.9977	0.9942	0.9837	0.9466	0.8411	0.6373	0.4352	0.4950	0.7923	0.9673	0.9948	0.9983	(89)
MIT 2	18.6034	18.7804	19.0599	19.4244	19.7153	19.8691	19.8963	19.8963	19.8049	19.4254	18.9515	18.5811	(90)
Living area fraction	18.7976	18.9745	19.2540	19.6186	19.9148	20.0757	20.1098	20.1066	20.0054	19.6182	19.1438	18.7740	(91)
MIT	18.7976	18.9745	19.2540	19.6186	19.9148	20.0757	20.1098	20.1066	20.0054	19.6182	19.1438	18.7740	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7976	18.9745	19.2540	19.6186	19.9148	20.0757	20.1098	20.1066	20.0054	19.6182	19.1438	18.7740	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9968	0.9925	0.9804	0.9420	0.8422	0.6538	0.4612	0.5212	0.8005	0.9636	0.9933	0.9977	(94)
Useful gains	465.8876	554.8757	632.1560	688.1592	663.6234	508.1935	342.0849	357.1617	498.7892	517.1003	461.2314	437.2852	(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	1473.2276	1426.8443	1289.9796	1072.2633	820.0829	541.3714	347.0091	365.7976	586.0410	900.2950	1207.3789	1467.4020	(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	749.4609	585.9629	489.4207	276.5550	116.4059	0.0000	0.0000	0.0000	0.0000	285.0969	537.2262	766.4069	(98)
Space heating												3806.5355	(98)
Space heating per m2										(98) / (4) =		47.0640	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	929.3551	731.6200	750.0383	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8565	0.9176	0.8911	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	795.9534	671.3494	668.3310	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1001.0910	957.6990	893.3040	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	147.6991	213.0441	167.3798	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											528.1231 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	36.9248	53.2610	41.8450	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											132.0308 (107)
Space cooling per m2											1.6324 (108)
Energy for space heating											47.0640 (99)
Energy for space cooling											1.6324 (108)
Total											48.6964 (109)
Target Fabric Energy Efficiency (TFEE)											56.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Moresby Detached			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 018, Chipping Lane , Longridge , PR3				
SAP Rating	83 B	DER	18.46	TER	18.80
Environmental	86 B	% DER<TER	1.82		
CO₂ Emissions (t/year)	1.36	DFEE	51.90	TFEE	54.98
General Requirements Compliance	Pass	% DFEE<TFEE	5.61		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Detached House, total floor area 81 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) 18.80 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.46 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.41 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% 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

Not applicable

9 Summertime temperature

Overheating risk (West Pennines (England)):Not significant OK

Based on:

Overshading:	Average
Windows facing North:	0.66 m ² , No overhang
Windows facing East:	5.35 m ² , No overhang
Windows facing South:	5.34 m ² , No overhang
Windows facing West:	3.71 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.2023 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.4528 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3849 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4907	0.4811	0.4715	0.4233	0.4137	0.3656	0.3656	0.3560	0.3849	0.4137	0.4330	0.4522 (22b)
Effective ac	0.6204	0.6157	0.6111	0.5896	0.5856	0.5668	0.5668	0.5634	0.5741	0.5856	0.5937	0.6022 (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					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			15.0600	1.3347	20.1009		(27)					
150mm Platinum			40.4400	0.1500	6.0660		(28a)					
50mm A. Platinum	128.2300	17.0300	111.2000	0.2700	30.0240		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m ²)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		62.6093 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.1830 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0294 (36)					
Total fabric heat loss							(33) + (36) = 71.6387 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.4854	Feb 40.1804	Mar 39.8813	Apr 38.4768	May 38.2140	Jun 36.9907	Jul 36.9907	Aug 36.7641	Sep 37.4619	Oct 38.2140	Nov 38.7456	Dec 39.3014 (38)
Heat transfer coeff	112.1242	111.8191	111.5201	110.1155	109.8527	108.6294	108.6294	108.4029	109.1006	109.8527	110.3843	110.9401 (39)
Average = Sum(39)m / 12 =												110.1143 (39)
HLP	Jan 1.3863	Feb 1.3825	Mar 1.3788	Apr 1.3615	May 1.3582	Jun 1.3431	Jul 1.3431	Aug 1.3403	Sep 1.3489	Oct 1.3582	Nov 1.3648	Dec 1.3717 (40)
HLP (average)												1.3615 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi 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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Total heat required for water heating calculated for each month	14.1210	12.7398	14.0688	13.5744	13.9973	13.5117	13.9409	13.9775	13.5459	14.0392	13.6335	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	(61)
Solar input	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	(62)
Output from w/h	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	(64)
Total per year (kWh/year) = Sum(63)m =	54.0190	47.3427	49.0840	43.1199	41.6176	36.2711	33.9656	38.4711	38.7809	44.7586	48.4346	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table b)	72.6061	70.4504	65.9732	59.8887	55.9377	50.3766	45.6527	51.7084	53.8623	60.1594	67.2703	70.4610	(72)
Total internal gains	377.1102	375.0095	361.4216	339.5020	317.2343	295.7831	281.8533	287.8540	299.1186	321.2508	346.6784	365.7592	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W	(83)						
North	0.6600	10.6334	0.7100	0.7000	0.7700	2.4172	(74)						
East	5.3500	19.6403	0.7100	0.7000	0.7700	36.1902	(76)						
South	5.3400	46.7521	0.7100	0.7000	0.7700	85.9868	(78)						
West	3.7100	19.6403	0.7100	0.7000	0.7700	25.0964	(80)						
Solar gains	149.6905	265.3330	384.6753	503.3079	581.1567	582.7591	559.5627	501.8223	426.4582	299.6498	181.3227	126.7146	(83)
Total gains	526.8007	640.3425	746.0969	842.8098	898.3910	878.5421	841.4160	789.6763	725.5769	620.9006	528.0010	492.4738	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	38.3079	38.4124	38.5154	39.0067	39.1000	39.5403	39.5403	39.6230	39.3696	39.1000	38.9117	38.7168
alpha	3.5539	3.5608	3.5677	3.6004	3.6067	3.6360	3.6360	3.6415	3.6246	3.6067	3.5941	3.5811	
util living area	0.9920	0.9836	0.9649	0.9196	0.8302	0.6848	0.5342	0.5820	0.7980	0.9461	0.9857	0.9937	(86)
MIT	19.1711	19.4130	19.7826	20.2408	20.6241	20.8721	20.9611	20.9465	20.7626	20.2435	19.6200	19.1321	(87)
Th 2	19.7739	19.7768	19.7796	19.7930	19.7955	19.8072	19.8072	19.8094	19.8027	19.7955	19.7904	19.7851	(88)
util rest of house	0.9899	0.9792	0.9550	0.8960	0.7789	0.5907	0.4041	0.4519	0.7199	0.9255	0.9811	0.9920	(89)
MIT 2	17.3658	17.7183	18.2524	18.9067	19.4172	19.7137	19.7904	19.7838	19.6031	18.9261	18.0306	17.3159	(90)
Living area fraction	17.7182	18.0492	18.5511	19.1671	19.6528	19.9398	20.0189	20.0108	19.8295	19.1833	18.3409	17.6704	(92)
Temperature adjustment	17.5682	17.8992	18.4011	19.0171	19.5028	19.7898	19.8689	19.8608	19.6795	19.0333	18.1909	17.5204	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	518.2234	620.5311	701.0016	738.8716	686.5219	517.6117	346.0232	361.6360	515.4368	563.4494	513.0718	486.0145	(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	1407.6886	1453.5548	1327.2153	1114.0544	857.1575	563.7691	355.1020	375.1632	608.7224	926.4188	1224.2591	1477.7713	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	721.2821	559.7919	465.9029	270.1316	126.9529	0.0000	0.0000	0.0000	0.0000	270.0492	512.0548	737.8670	(98)
Space heating												3664.0325	(98)
Space heating per m2												45.3021	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4048.6547 (211)
Space heating requirement	721.2821	559.7919	465.9029	270.1316	126.9529	0.0000	0.0000	0.0000	0.0000	270.0492	512.0548	737.8670	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	796.9968	618.5546	514.8099	298.4880	140.2795	0.0000	0.0000	0.0000	0.0000	298.3969	565.8064	815.3227	(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	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	(64)
Efficiency of water heater (217)m	89.8837	89.8206	89.6948	89.4184	88.8607	87.3000	87.3000	87.3000	87.3000	89.3913	89.7582	89.9092	(217)
Fuel for water heating, kWh/month	184.6461	162.0397	168.4735	148.7971	144.7647	128.7957	120.9750	136.5069	137.4516	154.4845	166.0581	179.2519	(219)
Water heating fuel used													1832.2447 (219)
Annual totals kWh/year													
Space heating fuel - main system													4048.6547 (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)													353.9840 (232)
Total delivered energy for all uses													6309.8834 (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	4048.6547	0.2160	874.5094	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1832.2447	0.2160	395.7648	(264)
Space and water heating			1270.2743	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	353.9840	0.5190	183.7177	(268)
Total CO2, kg/year			1492.9170	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4600	(273)

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

DER			18.4600	ZC1
Total Floor Area		TFA	80.8800	
Assumed number of occupants		N	2.4793	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.2117	ZC2
CO2 emissions from cooking, equation (L16)			2,2070	ZC3
Total CO2 emissions			36.8787	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			36.8787	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4017 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			15.0600	1.3258	19.9659		(27)					
150mm Platinum			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinum	128.2300	17.0300	111.2000	0.1800	20.0160		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m ²)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		52.4663 (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)							10.3390 (36)					
Total fabric heat loss						(33) + (36) =	62.8053 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	101.6184	101.3783	101.1429	100.0373	99.8305	98.8676	98.8676	98.6892	99.2385	99.8305	100.2489	100.6864 (39)
Average = Sum(39)m / 12 =												100.0364 (39)
HLP	Jan 1.2564	Feb 1.2534	Mar 1.2505	Apr 1.2369	May 1.2343	Jun 1.2224	Jul 1.2224	Aug 1.2202	Sep 1.2270	Oct 1.2343	Nov 1.2395	Dec 1.2449 (40)
HLP (average)												1.2368 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1464.5812 (45)
Water storage loss:	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi 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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Total heat required for water heating calculated for each month	50.9589	45.4150	48.3835	44.9866	44.5887	41.3142	42.6913	44.5887	44.9866	48.3835	48.6590	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	(61)
Solar input	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	(62)
Output from w/h	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	198.0134	(64)
	63.2284	55.5115	57.6627	50.9729	49.2655	43.2218	41.1532	46.1239	46.6411	53.3447	57.1910	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	61.6353	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table b)	84.9845	82.6064	77.5037	70.7957	66.2171	60.0302	55.3135	61.9945	64.7793	71.6998	79.4320	82.8432	(72)
Total internal gains	389.4886	387.1655	372.9521	350.4090	327.5137	305.4367	291.5140	298.1400	310.0355	332.7913	358.8400	378.1414	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	(80)						
North	0.6600	10.6334	0.6300	0.7000	0.7700	2.1448	(74)						
East	5.3500	19.6403	0.6300	0.7000	0.7700	32.1124	(76)						
South	5.3400	46.7521	0.6300	0.7000	0.7700	76.2981	(78)						
West	3.7100	19.6403	0.6300	0.7000	0.7700	22.2686	(80)						
Solar gains	132.8239	235.4363	341.3316	446.5971	515.6742	517.0961	496.5134	445.2789	378.4066	265.8864	160.8919	112.4369	(83)
Total gains	522.3125	622.6018	714.2837	797.0061	843.1879	822.5328	788.0274	743.4189	688.4421	598.6777	519.7319	490.5783	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	55.2721	55.4030	55.5320	56.1457	56.2620	56.8100	56.8100	56.9127	56.5977	56.2620	56.0272	55.7838
alpha	4.6848	4.6935	4.7021	4.7430	4.7508	4.7873	4.7873	4.7942	4.7732	4.7508	4.7351	4.7189	
util living area	0.9972	0.9933	0.9823	0.9482	0.8634	0.7045	0.5372	0.5869	0.8246	0.9677	0.9941	0.9979	(86)
MIT	19.6602	19.8446	20.1277	20.4802	20.7708	20.9390	20.9866	20.9798	20.8659	20.4752	19.9982	19.6280	(87)
Th 2	19.8751	19.8775	19.8798	19.8906	19.8927	19.9021	19.9021	19.9039	19.8985	19.8927	19.8885	19.8843	(88)
util rest of house	0.9963	0.9910	0.9760	0.9290	0.8133	0.6084	0.4107	0.4587	0.7454	0.9518	0.9917	0.9972	(89)
MIT 2	18.1027	18.3728	18.7839	19.2895	19.6713	19.8623	19.8974	19.8959	19.7941	19.2933	18.6056	18.0620	(90)
Living area fraction	18.4068	18.6601	19.0463	19.5220	19.8860	20.0725	20.1100	20.1075	20.0033	19.5240	18.8775	18.3677	(92)
Temperature adjustment	18.4068	18.6601	19.0463	19.5220	19.8860	20.0725	20.1100	20.1075	20.0033	19.5240	18.8775	18.3677	(93)
adjusted MIT	18.4068	18.6601	19.0463	19.5220	19.8860	20.0725	20.1100	20.1075	20.0033	19.5240	18.8775	18.3677	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	519.3722	614.7045	692.5257	734.0108	685.4595	513.7019	343.1636	359.5757	519.1631	565.6025	513.7012	488.4836	(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	1433.5105	1394.9770	1268.9674	1062.5919	817.2111	541.0487	347.0264	365.8884	585.8377	890.8887	1180.6828	1426.4994	(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	680.1189	524.3431	428.8726	236.5784	98.0231	0.0000	0.0000	0.0000	0.0000	242.0129	480.2268	697.8838	(98)
Space heating												3388.0596	(98)
Space heating per m2												41.8900	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													3627.4728 (211)
Space heating requirement	680.1189	524.3431	428.8726	236.5784	98.0231	0.0000	0.0000	0.0000	0.0000	242.0129	480.2268	697.8838	(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)	728.1787	561.3952	459.1784	253.2959	104.9498	0.0000	0.0000	0.0000	0.0000	259.1145	514.1614	747.1989	(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	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	(64)
Efficiency of water heater (217)m	87.8616	87.6048	87.0934	85.9658	83.8705	80.3000	80.3000	80.3000	80.3000	85.9044	87.3554	87.9549	(217)
Fuel for water heating, kWh/month	230.8228	203.4365	212.9055	191.3133	189.8525	174.6465	167.3246	186.5277	188.5877	200.7347	210.7211	225.1307	(219)
Water heating fuel used													2382.0038 (219)
Annual totals kWh/year													
Space heating fuel - main system													3627.4728 (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)													353.9840 (232)
Total delivered energy for all uses													6438.4606 (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	3627.4728	0.2160	783.5341 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2382.0038	0.2160	514.5128 (264)
Space and water heating			1298.0470 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	353.9840	0.5190	183.7177 (268)
Total CO2, kg/m2/year			1520.6897 (272)
Emissions per m2 for space and water heating			16.0490 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2715 (272b)
Emissions per m2 for pumps and fans			0.4813 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0490 * 1.00) + 2.2715 + 0.4813, rounded to 2 d.p.			18.8000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4022 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3419 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 infiltr rate												
Effective ac	0.4359	0.4273	0.4188	0.3761	0.3675	0.3248	0.3248	0.3162	0.3419	0.3675	0.3846	0.4017 (22b)
	0.5950	0.5913	0.5877	0.5707	0.5675	0.5527	0.5527	0.5500	0.5584	0.5675	0.5740	0.5807 (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					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			15.0600	1.3347	20.1009		(27)					
150mm Platinum			40.4400	0.1500	6.0660		(28a)					
50mm A. Platinum	128.2300	17.0300	111.2000	0.2700	30.0240		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m ²)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		62.6093 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.1830 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0294 (36)					
Total fabric heat loss						(33) + (36) =	71.6387 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8285	Feb 38.5878	Mar 38.3518	Apr 37.2435	May 37.0361	Jun 36.0708	Jul 36.0708	Aug 35.8920	Sep 36.4426	Oct 37.0361	Nov 37.4556	Dec 37.8942 (38)
Heat transfer coeff	110.4673	110.2265	109.9906	108.8822	108.6749	107.7095	107.7095	107.5308	108.0814	108.6749	109.0944	109.5329 (39)
Average = Sum(39)m / 12 =												108.8812 (39)
HLP	Jan 1.3658	Feb 1.3628	Mar 1.3599	Apr 1.3462	May 1.3437	Jun 1.3317	Jul 1.3317	Aug 1.3295	Sep 1.3363	Oct 1.3437	Nov 1.3488	Dec 1.3543 (40)
HLP (average)												1.3462 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1464.5812 (45)
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 (46)
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 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	0.0000 (57)
Heat gains from water heating, kWh/month	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 (59)
	32.2672	28.2211	29.1217	25.3890	24.3613	21.0220	19.4799	22.3535	22.6205	26.3620	28.7762	31.2491	(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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	43.3699	41.9957	39.1420	35.2625	32.7437	29.1972	26.1827	30.0451	31.4174	35.4328	39.9669	42.0015	(72)
Total internal gains	344.8740	343.5548	331.5904	311.8757	291.0404	271.6037	259.3833	263.1906	273.6736	293.5242	316.3750	334.2996	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
North	0.6600	10.6334	0.7100	0.7000	0.7700	2.4172	(74)						
East	5.3500	19.6403	0.7100	0.7000	0.7700	36.1902	(76)						
South	5.3400	46.7521	0.7100	0.7000	0.7700	85.9868	(78)						
West	3.7100	19.6403	0.7100	0.7000	0.7700	25.0964	(80)						
Solar gains	149.6905	265.3330	384.6753	503.3079	581.1567	582.7591	559.5627	501.8223	426.4582	299.6498	181.3227	126.7146	(83)
Total gains	494.5645	608.8878	716.2657	815.1836	872.1970	854.3628	818.9460	765.0129	700.1319	593.1740	497.6976	461.0143	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nll,m (see Table 9a)	38.8825	38.9674	39.0510	39.4485	39.5238	39.8780	39.8780	39.9443	39.7408	39.5238	39.3718	39.2142	21.0000 (85)
tau	3.5922	3.5978	3.6034	3.6299	3.6349	3.6585	3.6585	3.6630	3.6494	3.6349	3.6248	3.6143	
util living area	0.9935	0.9859	0.9684	0.9251	0.8380	0.6944	0.5429	0.5933	0.8090	0.9520	0.9881	0.9950	(86)
MIT	19.1583	19.4010	19.7721	20.2302	20.6174	20.8683	20.9599	20.9442	20.7544	20.2268	19.6006	19.1155	(87)
Th 2	19.7896	19.7919	19.7942	19.8048	19.8068	19.8161	19.8161	19.8178	19.8125	19.8068	19.8028	19.7986	(88)
util rest of house	0.9917	0.9821	0.9595	0.9029	0.7882	0.6010	0.4123	0.4628	0.7331	0.9332	0.9842	0.9936	(89)
MIT 2	18.1287	18.3710	18.7383	19.1881	19.5421	19.7498	19.8041	19.7993	19.6699	19.1956	18.5791	18.0927	(90)
Living area fraction	18.3297	18.5721	18.9401	19.3916	19.7521	19.9681	20.0297	20.0228	19.8816	19.3970	18.7786	18.2924	(91)
MIT	18.3297	18.5721	18.9401	19.3916	19.7521	19.9681	20.0297	20.0228	19.8816	19.3970	18.7786	18.2924	(92)
Temperature adjustment													0.0000
adjusted MIT	18.3297	18.5721	18.9401	19.3916	19.7521	19.9681	20.0297	20.0228	19.8816	19.3970	18.7786	18.2924	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9887	0.9768	0.9513	0.8935	0.7855	0.6142	0.4373	0.4872	0.7382	0.9248	0.9795	0.9911	(94)
Useful gains	488.9712	594.7463	681.3620	728.3927	685.1357	524.7299	358.1191	372.7010	516.8674	548.5741	487.5172	456.8984	(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	1549.8183	1507.0294	1368.2963	1142.3474	875.0575	578.1996	369.4142	389.5655	624.8826	956.0074	1274.0647	1543.5799	(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	789.2703	613.0542	511.0791	298.0474	141.3018	0.0000	0.0000	0.0000	0.0000	303.1304	566.3142	808.4910	(98)
Space heating												4030.6884	(98)
Space heating per m2												(98) / (4) =	49.8354 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1012.4697	797.0507	817.2340	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8137	0.8779	0.8526	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	823.8763	699.7347	696.7905	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1091.2200	1047.9140	986.4633	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	192.4875	259.0454	215.5166	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											667.0494 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	48.1219	64.7613	53.8791	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											166.7624 (107)
Space cooling per m2											2.0618 (108)
Energy for space heating											49.8354 (99)
Energy for space cooling											2.0618 (108)
Total											51.8973 (109)
Dwelling Fabric Energy Efficiency (DFEE)											51.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.4400 (1b)	x 2.3300 (2b)	= 94.2252 (1b) - (3b)
First floor	40.4400 (1c)	x 2.5600 (2c)	= 103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (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) =					30.0000 / (5) = 0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4017 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			15.0600	1.3258	19.9659		(27)					
150mm Platinum			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinum	128.2300	17.0300	111.2000	0.1800	20.0160		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m ²)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 52.4663		(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)							10.3390 (36)					
Total fabric heat loss							(33) + (36) = 62.8053 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	101.6184	101.3783	101.1429	100.0373	99.8305	98.8676	98.8676	98.6892	99.2385	99.8305	100.2489	100.6864 (39)
Average = Sum(39)m / 12 =												100.0364 (39)
HLP	Jan 1.2564	Feb 1.2534	Mar 1.2505	Apr 1.2369	May 1.2343	Jun 1.2224	Jul 1.2224	Aug 1.2202	Sep 1.2270	Oct 1.2343	Nov 1.2395	Dec 1.2449 (40)
HLP (average)												1.2368 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1464.5812 (45)
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 (46)
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 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	0.0000 (57)
Heat gains from water heating, kWh/month	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 (59)
	32.2672	28.2211	29.1217	25.3890	24.3613	21.0220	19.4799	22.3535	22.6205	26.3620	28.7762	31.2491	(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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	43.3699	41.9957	39.1420	35.2625	32.7437	29.1972	26.1827	30.0451	31.4174	35.4328	39.9669	42.0015	(72)
Total internal gains	344.8740	343.5548	331.5904	311.8757	291.0404	271.6037	259.3833	263.1906	273.6736	293.5242	316.3750	334.2996	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
North	0.6600	10.6334	0.6300	0.7000	0.7700	2.1448	(74)						
East	5.3500	19.6403	0.6300	0.7000	0.7700	32.1124	(76)						
South	5.3400	46.7521	0.6300	0.7000	0.7700	76.2981	(78)						
West	3.7100	19.6403	0.6300	0.7000	0.7700	22.2686	(80)						
Solar gains	132.8239	235.4363	341.3316	446.5971	515.6742	517.0961	496.5134	445.2789	378.4066	265.8864	160.8919	112.4369	(83)
Total gains	477.6980	578.9911	672.9220	758.4729	806.7146	788.6998	755.8967	708.4696	652.0802	559.4106	477.2669	446.7366	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	55.2721	55.4030	55.5320	56.1457	56.2620	56.8100	56.8100	56.9127	56.5977	56.2620	56.0272	55.7838	21.0000 (85)
tau	4.6848	4.6935	4.7021	4.7430	4.7508	4.7873	4.7873	4.7942	4.7732	4.7508	4.7351	4.7189	
alpha	0.9981	0.9950	0.9860	0.9563	0.8787	0.7256	0.5574	0.6113	0.8464	0.9748	0.9959	0.9986	(86)
util living area	19.6100	19.7964	20.0842	20.4455	20.7489	20.9307	20.9843	20.9760	20.8479	20.4363	19.9509	19.5784	(87)
MIT	19.8751	19.8775	19.8798	19.8906	19.8927	19.9021	19.9021	19.9039	19.8985	19.8927	19.8885	19.8843	(88)
Th 2	0.9974	0.9933	0.9808	0.9395	0.8317	0.6298	0.4275	0.4799	0.7714	0.9620	0.9941	0.9981	(89)
util rest of house	18.6150	18.8024	19.0893	19.4484	19.7247	19.8707	19.8983	19.8973	19.8155	19.4472	18.9659	18.5907	(90)
Living area fraction	18.8093	18.9965	19.2835	19.6431	19.9246	20.0776	20.1103	20.1079	20.0171	19.6403	19.1582	18.7835	(91)
MIT	18.8093	18.9965	19.2835	19.6431	19.9246	20.0776	20.1103	20.1079	20.0171	19.6403	19.1582	18.7835	(92)
Temperature adjustment	18.8093	18.9965	19.2835	19.6431	19.9246	20.0776	20.1103	20.1079	20.0171	19.6403	19.1582	18.7835	(93)
adjusted MIT													

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9914	0.9772	0.9349	0.8333	0.6465	0.4531	0.5058	0.7808	0.9581	0.9925	0.9975	(94)
Useful gains	476.0507	574.0028	657.5833	709.0584	672.2468	509.9056	342.4854	358.3102	509.1570	535.9926	473.7053	445.6033	(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	1474.4094	1429.0746	1292.9620	1074.7070	821.0673	541.5578	347.0551	365.9267	587.2020	902.4969	1208.8195	1468.3614	(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	742.7789	574.6082	472.7217	263.2669	110.7224	0.0000	0.0000	0.0000	0.0000	272.6793	529.2822	760.9320	(98)
Space heating												3726.9917	(98)
Space heating per m2										(98) / (4) =		46.0805	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	929.3551	731.6200	750.0383	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8614	0.9219	0.9001	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	800.5006	674.4759	675.1108	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1014.4711	974.2200	920.3736	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	154.0588	223.0096	182.4755	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											559.5439 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	38.5147	55.7524	45.6189	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											139.8860 (107)
Space cooling per m2											1.7295 (108)
Energy for space heating											46.0805 (99)
Energy for space cooling											1.7295 (108)
Total											47.8101 (109)
Target Fabric Energy Efficiency (TFEE)											55.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Moresby End-Terrace BeamBlock			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 055, Chipping Lane , Longridge , PR3				
SAP Rating	84 B	DER	17.32	TER	18.14
Environmental	87 B	% DER<TER	4.55		
CO₂ Emissions (t/year)	1.25	DFEE	46.14	TFEE	51.23
General Requirements Compliance	Pass	% DFEE<TFEE	9.94		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 81 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) 18.14 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.32 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.41 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% 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

Not applicable

9 Summertime temperature

Overheating risk (West Pennines (England)):Not significant OK

Based on:

Overshading: Average
Windows facing North East: 5.34 m², No overhang
Windows facing South East: 5.35 m², No overhang
Windows facing North West: 3.71 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	40.4400 (1b)	x 2.3300 (2b)	= 94.2252 (1b) - (3b)
First floor	40.4400 (1c)	x 2.5600 (2c)	= 103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (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) = 0.2023 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4528 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3849 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4907	0.4811	0.4715	0.4233	0.4137	0.3656	0.3656	0.3560	0.3849	0.4137	0.4330	0.4522 (22b)
Effective ac	0.6204	0.6157	0.6111	0.5896	0.5856	0.5668	0.5668	0.5634	0.5741	0.5856	0.5937	0.6022 (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					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			14.4000	1.3347	19.2200		(27)					
150mm B&B			40.4400	0.1400	5.6616		(28a)					
50mm A. Platinium	87.7100	16.3700	71.3400	0.2700	19.2618		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m ²)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 50.5618		(33)					
E-WM-22			40.5200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.8300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2308 (36)					
Total fabric heat loss							(33) + (36) = 57.7926 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.4854	Feb 40.1804	Mar 39.8813	Apr 38.4768	May 38.2140	Jun 36.9907	Jul 36.9907	Aug 36.7641	Sep 37.4619	Oct 38.2140	Nov 38.7456	Dec 39.3014 (38)
Heat transfer coeff	98.2781	97.9730	97.6740	96.2694	96.0066	94.7833	94.7833	94.5568	95.2545	96.0066	96.5382	97.0940 (39)
Average = Sum(39)m / 12 =												96.2682 (39)
HLP	Jan 1.2151	Feb 1.2113	Mar 1.2076	Apr 1.1903	May 1.1870	Jun 1.1719	Jul 1.1719	Aug 1.1691	Sep 1.1777	Oct 1.1870	Nov 1.1936	Dec 1.2005 (40)
HLP (average)												1.1903 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy conte	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Energy content (annual)												Total = Sum(45)m = 1464.5812 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.1210	12.7398	14.0688	13.5744	13.9973	13.5117	13.9409	13.9775	13.5459	14.0392	13.6335	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	14.1095	(61)
Total heat required for water heating calculated for each month	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	(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	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	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	161.1640	(64)
Heat gains from water heating, kWh/month	54.0190	47.3427	49.0840	43.1199	41.6176	36.2711	33.9656	38.4711	38.7809	44.7586	48.4346	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	52.4230	(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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1834	17.9267	14.5790	11.0372	8.2504	6.9654	7.5263	9.7830	13.1307	16.6725	19.4593	20.7443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	72.6061	70.4504	65.9732	58.8887	55.9377	50.3766	45.6527	51.7084	53.8623	60.1594	67.2703	70.4610	(72)
Total internal gains	377.2496	375.1333	361.5222	339.5782	317.2913	295.8311	281.9052	287.9215	299.2093	321.3659	346.8127	365.9024	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	α Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	5.3400	11.2829	0.7100	0.7000	0.7700	20.7517 (75)							
Southeast	5.3500	36.7938	0.7100	0.7000	0.7700	67.7982 (77)							
Northwest	3.7100	11.2829	0.7100	0.7000	0.7700	14.4174 (81)							
Solar gains	102.9673	187.0731	286.9904	407.6040	504.0218	521.2580	493.8586	418.7342	328.2557	215.1218	125.4584	86.7420	(83)
Total gains	480.2169	562.2064	648.5126	747.1821	821.3131	817.0892	775.7638	706.6558	627.4650	536.4877	472.2711	452.6444	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hi} (C)													21.0000 (85)
Utilisation factor for gains for living area, $u_{li,m}$ (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.5962	46.7413	46.8844	47.5684	47.6986	48.3142	48.3142	48.4300	48.0752	47.6986	47.4359	47.1644	
alpha	4.1064	4.1161	4.1236	4.1112	4.1799	4.2209	4.2209	4.2287	4.2050	4.1799	4.1624	4.1443	
util living area	0.9954	0.9907	0.9780	0.9375	0.8391	0.6735	0.5188	0.5825	0.8261	0.9641	0.9916	0.9964	(86)
MIT	19.4401	19.6305	19.9496	20.3739	20.7252	20.9237	20.9802	20.9684	20.8123	20.3508	19.8231	19.4125	(87)
Th 2	19.9079	19.9109	19.9139	19.9278	19.9304	19.9425	19.9425	19.9448	19.9379	19.9304	19.9251	19.9196	(88)
util rest of house	0.9942	0.9881	0.9715	0.9183	0.7910	0.5857	0.4028	0.4635	0.7562	0.9494	0.9887	0.9954	(89)
MIT 2	17.8328	18.1120	18.5758	19.1863	19.6528	19.8873	19.9340	19.9296	19.7764	19.1668	18.4035	17.8002	(90)
Living area fraction	18.1465	18.4085	18.8440	19.4182	19.8622	20.0897	20.1382	20.1324	19.9786	19.3980	18.6807	18.1150	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.9965	18.2585	18.6940	19.2682	19.7122	19.9397	19.9892	19.9824	19.8286	19.2490	18.5307	17.9650	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	475.7096	552.1734	623.3407	674.8708	640.3226	478.3270	316.5538	330.6960	469.1475	502.3390	464.2747	449.2627	(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	1346.0698	1300.7687	1191.0365	998.1387	769.2221	506.1127	321.1486	338.7387	545.6744	630.2624	1103.4966	1336.4956	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	647.5480	508.4320	422.3657	232.7529	95.9012	0.0000	0.0000	0.0000	0.0000	243.9750	460.2398	660.1013	(98)
Space heating													3271.3159 (98)
Space heating per m2													(98) / (4) = 40.4465 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3614.7137 (211)
Space heating requirement	647.5480	508.4320	422.3657	232.7529	95.9012	0.0000	0.0000	0.0000	0.0000	243.9750	460.2398	660.1013	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	715.5226	561.8033	466.7024	257.1855	105.9682	0.0000	0.0000	0.0000	0.0000	269.5856	508.5522	729.3937	(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	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	(64)
Efficiency of water heater (217)m	89.8283	89.7677	89.6343	89.3093	88.6386	87.3000	87.3000	87.3000	87.3000	89.3167	89.6957	89.8537	(217)
Fuel for water heating, kWh/month	184.7600	162.1352	168.5873	148.9788	145.1273	128.7957	120.9750	136.5069	137.4516	154.6136	166.1739	179.3627	(219)
Water heating fuel used													1833.4680 (219)
Annual totals kWh/year													
Space heating fuel - main system													3614.7137 (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)													356.4445 (232)
Total delivered energy for all uses													5879.6262 (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	3614.7137	0.2160	780.7782	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1833.4680	0.2160	396.0291	(264)
Space and water heating			1176.8072	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	356.4445	0.5190	184.9947	(268)
Total CO2, kg/year			1400.7270	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3200	(273)

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

DER			17.3200	ZC1
Total Floor Area		TFA	80.8800	
Assumed number of occupants		N	2.4793	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.2117	ZC2
CO2 emissions from cooking, equation (L16)			2.2070	ZC3
Total CO2 emissions			35.7387	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			35.7387	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.4017 (18)								
Number of sides sheltered				2 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 infiltr rate	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			14.4000	1.3258	19.0909		(27)					
150mm B&B			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinium	87.7100	16.3700	71.3400	0.1800	12.8412		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m ²)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		44.4165 (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)							9.1311 (36)					
Total fabric heat loss						(33) + (36) =	53.5476 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	92.3607	92.1206	91.8852	90.7796	90.5728	89.6098	89.6098	89.4315	89.9808	90.5728	90.9912	91.4287 (39)
Average = Sum(39)m / 12 =												90.7786 (39)
HLP	Jan 1.1419	Feb 1.1390	Mar 1.1361	Apr 1.1224	May 1.1198	Jun 1.1079	Jul 1.1079	Aug 1.1057	Sep 1.1125	Oct 1.1198	Nov 1.1250	Dec 1.1304 (40)
HLP (average)												1.1224 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi 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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)		
Total heat required for water heating calculated for each month	50.9589	45.4150	48.3835	44.9866	44.5887	41.3142	42.6913	44.5887	44.9866	48.3835	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	48.6590	(61)
Solar input	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	(62)
Output from w/h	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	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)
Heat gains from water heating, kWh/month	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	184.0763	(64)
	63.2284	55.5115	57.6627	50.9729	49.2655	43.2218	41.1532	46.1239	46.6411	53.3447	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	57.1910	(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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1834	17.9267	14.5790	11.0372	8.2504	6.9654	7.5263	9.7830	13.1307	16.6725	19.4593	20.7443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table b)	84.9845	82.6064	77.5037	70.7957	66.2171	60.0302	55.3135	61.9945	64.7793	71.6998	79.4320	82.8432	(72)
Total internal gains	389.6279	387.2893	373.0527	350.4852	327.5707	305.4848	291.5660	298.2076	310.1262	332.9063	358.9743	378.2846	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	5.3400	11.2829	0.6300	0.7000	0.7700	18.4135 (75)							
Southeast	5.3500	36.7938	0.6300	0.7000	0.7700	60.1590 (77)							
Northwest	3.7100	11.2829	0.6300	0.7000	0.7700	12.7929 (81)							
Solar gains	91.3653	165.9944	254.6534	361.6767	447.2306	462.5247	438.2126	371.5529	291.2691	190.8827	111.3223	76.9682	(83)
Total gains	480.9932	553.2837	627.7061	712.1619	774.8012	768.0095	729.7786	669.7605	601.3953	523.7891	470.2966	455.2528	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	60.8123	60.9708	61.1270	61.8714	62.0128	62.6791	62.6791	62.8041	62.4208	62.0128	61.7276	61.4322	(86)
tau	5.0542	5.0647	5.0751	5.1248	5.1342	5.1786	5.1786	5.1869	5.1614	5.1342	5.1152	5.0955	(87)
util living area	0.9981	0.9957	0.9883	0.9589	0.8698	0.6968	0.5298	0.5943	0.8507	0.9776	0.9960	0.9986	(88)
MIT	19.7646	19.9154	20.1712	20.5151	20.8034	20.9552	20.9911	20.9844	20.8723	20.4980	20.0711	19.7398	(89)
Th 2	19.9667	19.9691	19.9715	19.9826	19.9847	19.9944	19.9944	19.9962	19.9906	19.9847	19.9805	19.9761	(90)
util rest of house	0.9974	0.9943	0.9840	0.9435	0.8233	0.6069	0.4142	0.4746	0.7806	0.9663	0.9944	0.9981	(91)
MIT 2	18.3193	18.5410	18.9141	19.4114	19.7923	19.9647	19.9911	19.9897	19.8868	19.3966	18.7771	18.2897	(92)
Living area fraction	18.6015	18.8093	19.1595	19.6268	19.9897	20.1581	20.1863	20.1839	20.0792	19.6117	19.0297	18.5728	(93)
MIT	18.6015	18.8093	19.1595	19.6268	19.9897	20.1581	20.1863	20.1839	20.0792	19.6117	19.0297	18.5728	(94)
Temperature adjustment	18.6015	18.8093	19.1595	19.6268	19.9897	20.1581	20.1863	20.1839	20.0792	19.6117	19.0297	18.5728	(95)
adjusted MIT	18.6015	18.8093	19.1595	19.6268	19.9897	20.1581	20.1863	20.1839	20.0792	19.6117	19.0297	18.5728	(96)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(97)
Useful gains	479.1352	548.7864	614.7771	667.0231	638.0818	478.1005	318.7787	333.4756	473.7413	503.1900	466.5791	453.9088	(98)
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	(99)
Heat loss rate W	1320.8960	1281.3312	1163.2228	973.7789	750.8205	498.0606	321.3674	338.3999	538.0160	816.2114	1085.4971	1314.0890	(100)
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	(101)
Space heating kWh	626.2700	492.2701	408.0436	220.8642	83.8776	0.0000	0.0000	0.0000	0.0000	232.8879	445.6210	639.9741	(102)
Space heating												3149.8083	(103)
Space heating per m2												38.9442	(104)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													3372.3857 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	626.2700	492.2701	408.0436	220.8642	83.8776	0.0000	0.0000	0.0000	0.0000	232.8879	445.6210	639.9741	(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)	670.5246	527.0557	436.8775	236.4713	89.8047	0.0000	0.0000	0.0000	0.0000	249.3446	477.1102	685.1971	(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	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	(64)
Efficiency of water heater (217)m	87.7017	87.4755	86.9817	85.7942	83.5195	80.3000	80.3000	80.3000	80.3000	85.8084	87.1940	87.7908	(217)
Fuel for water heating, kWh/month	231.2438	203.7374	213.1789	191.6960	190.6504	174.6465	167.3246	186.5277	188.5877	200.9594	211.1111	225.5515	(219)
Water heating fuel used													2385.2152 (219)
Annual totals kWh/year													
Space heating fuel - main system													3372.3857 (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)													356.4445 (232)
Total delivered energy for all uses													6189.0454 (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	3372.3857	0.2160	728.4353 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2385.2152	0.2160	515.2065 (264)
Space and water heating			1243.6418 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	356.4445	0.5190	184.9947 (268)
Total CO2, kg/m2/year			1467.5615 (272)
Emissions per m2 for space and water heating			15.3764 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2873 (272b)
Emissions per m2 for pumps and fans			0.4813 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3764 * 1.00) + 2.2873 + 0.4813, rounded to 2 d.p.			18.1400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.4400 (1b)	x 2.3300 (2b)	= 94.2252 (1b) - (3b)
First floor	40.4400 (1c)	x 2.5600 (2c)	= 103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (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) =					30.0000 / (5) = 0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4022 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3419 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4359	0.4273	0.4188	0.3761	0.3675	0.3248	0.3248	0.3162	0.3419	0.3675	0.3846	0.4017 (22b)
Effective ac	0.5950	0.5913	0.5877	0.5707	0.5675	0.5527	0.5527	0.5500	0.5584	0.5675	0.5740	0.5807 (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					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			14.4000	1.3347	19.2200		(27)					
150mm B&B			40.4400	0.1400	5.6616		(28a)					
50mm A. Platinium	87.7100	16.3700	71.3400	0.2700	19.2618		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m ²)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 50.5618		(33)					
E-WM-22			40.5200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.8300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2308 (36)					
Total fabric heat loss							(33) + (36) = 57.7926 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8285	Feb 38.5878	Mar 38.3518	Apr 37.2435	May 37.0361	Jun 36.0708	Jul 36.0708	Aug 35.8920	Sep 36.4426	Oct 37.0361	Nov 37.4556	Dec 37.8942 (38)
Heat transfer coeff	96.6212	96.3804	96.1445	95.0361	94.8288	93.8634	93.8634	93.6847	94.2353	94.8288	95.2483	95.6868 (39)
Average = Sum(39)m / 12 =												95.0351 (39)
HLP	Jan 1.1946	Feb 1.1916	Mar 1.1887	Apr 1.1750	May 1.1725	Jun 1.1605	Jul 1.1605	Aug 1.1583	Sep 1.1651	Oct 1.1725	Nov 1.1776	Dec 1.1831 (40)
HLP (average)												1.1750 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy conte	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Energy content (annual)												Total = Sum(45)m = 1464.5812 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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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	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	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	32.2672	28.2211	29.1217	25.3890	24.3613	21.0220	19.4799	22.3535	22.6205	26.3620	28.7762	31.2491	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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1834	17.9267	14.5790	11.0372	8.2504	6.9654	7.5263	9.7830	13.1307	16.6725	19.4593	20.7443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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 c.g. evaporation (negative values) (Table 5)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	43.3699	41.9957	39.1420	35.2625	32.7437	29.1972	26.1827	30.0451	31.4174	35.4328	39.9669	42.0015	(72)
Total internal gains	345.0134	343.6786	331.6911	311.9519	291.0973	271.6518	259.4352	263.2582	273.7643	293.6393	316.5093	334.4428	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	5.3400	11.2829	0.7100	0.7000	0.7700	20.7517 (75)							
Southeast	5.3500	36.7938	0.7100	0.7000	0.7700	67.7982 (77)							
Northwest	3.7100	11.2829	0.7100	0.7000	0.7700	14.4174 (81)							
Solar gains	102.9673	187.0731	286.9904	407.6040	504.0218	521.2580	493.8586	418.7342	328.2557	215.1218	125.4584	86.7420	(83)
Total gains	447.9806	530.7517	618.6815	719.5559	795.1191	792.9098	753.2939	681.9924	602.0200	508.7611	441.9677	421.1848	(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, nll,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	47.3952	47.5136	47.6302	48.1857	48.2911	48.7877	48.7877	48.8808	48.5952	48.2911	48.0784	47.8580		
alpha	4.1597	4.1676	4.1753	4.2124	4.2194	4.2525	4.2525	4.2587	4.2397	4.2194	4.2052	4.1905		
util living area	0.9965	0.9924	0.9810	0.9431	0.8478	0.6841	0.5282	0.5957	0.8390	0.9694	0.9934	0.9973	(86)	
MIT	19.4280	19.6186	19.9385	20.3626	20.7188	20.9209	20.9795	20.9665	20.8033	20.3328	19.8039	19.3967	(87)	
Th 2	19.9243	19.9267	19.9290	19.9400	19.9421	19.9517	19.9517	19.9535	19.9480	19.9421	19.9379	19.9336	(88)	
util rest of house	0.9955	0.9903	0.9753	0.9254	0.8014	0.5969	0.4116	0.4761	0.7718	0.9566	0.9911	0.9965	(89)	
MIT 2	18.4917	18.6832	19.0016	19.4216	19.7467	19.9123	19.9456	19.9423	19.8308	19.4019	18.8772	18.4676	(90)	
Living area fraction	fLA = Living area / (4) =													
MIT	18.6745	18.8658	19.1845	19.6053	19.9365	20.1092	20.1474	20.1423	20.0207	19.5836	19.0581	18.6490	(91)	
Temperature adjustment													0.0000	
adjusted MIT	18.6745	18.8658	19.1845	19.6053	19.9365	20.1092	20.1474	20.1423	20.0207	19.5836	19.0581	18.6490	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Useful gains	445.2307	524.0479	600.2060	660.9526	636.9911	484.4424	327.1219	340.2654	467.8818	483.7876	436.8816	419.1694	(94)		
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)		
Heat loss rate W	1388.8779	1346.0297	1219.5454	1017.3902	781.0574	517.1113	332.9736	350.5940	557.9362	851.9052	1138.9861	1382.5775	(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	702.0735	552.3718	460.7885	256.6351	107.1853	0.0000	0.0000	0.0000	0.0000	273.8796	505.5153	716.7756	(98)		
Space heating													3575.2246	(98)	
Space heating per m2													(98) / (4) =	44.2041	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	882.3163	694.5895	712.0035	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8632	0.9173	0.8879	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	761.5756	637.1678	632.1799	0.0000	0.0000	0.0000	0.0000	(102)
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	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	185.6738	248.5549	191.4583	0.0000	0.0000	0.0000	0.0000	(104)

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Space cooling											625.6869 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	46.4185	62.1387	47.8646	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											156.4217 (107)
Space cooling per m2											1.9340 (108)
Energy for space heating											44,2041 (99)
Energy for space cooling											1.9340 (108)
Total											46.1381 (109)
Dwelling Fabric Energy Efficiency (DFEE)											46.1 (109)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4017 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			14.4000	1.3258	19.0909		(27)					
150mm B&B			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinum	87.7100	16.3700	71.3400	0.1800	12.8412		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m2)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 44.4165		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1311 (36)					
Total fabric heat loss							(33) + (36) = 53.5476 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	92.3607	92.1206	91.8852	90.7796	90.5728	89.6098	89.6098	89.4315	89.9808	90.5728	90.9912	91.4287 (39)
Average = Sum(39)m / 12 =												90.7786 (39)
HLP	Jan 1.1419	Feb 1.1390	Mar 1.1361	Apr 1.1224	May 1.1198	Jun 1.1079	Jul 1.1079	Aug 1.1057	Sep 1.1125	Oct 1.1198	Nov 1.1250	Dec 1.1304 (40)
HLP (average)												1.1224 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

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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	0.0000 (57)
Heat gains from water heating, kWh/month	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 (59)
	32.2672	28.2211	29.1217	25.3890	24.3613	21.0220	19.4799	22.3535	22.6205	26.3620	28.7762	31.2491	(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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1834	17.9267	14.5790	11.0372	8.2504	6.9654	7.5263	9.7830	13.1307	16.6725	19.4593	20.7443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	43.3699	41.9957	39.1420	35.2625	32.7437	29.1972	26.1827	30.0451	31.4174	35.4328	39.9669	42.0015	(72)
Total internal gains	345.0134	343.6786	331.6911	311.9519	291.0973	271.6518	259.4352	263.2582	273.7643	293.6393	316.5093	334.4428	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	5.3400	11.2829	0.6300	0.7000	0.7700	18.4135	(75)						
Southeast	5.3500	36.7938	0.6300	0.7000	0.7700	60.1590	(77)						
Northwest	3.7100	11.2829	0.6300	0.7000	0.7700	12.7929	(81)						
Solar gains	91.3653	165.9944	254.6534	361.6767	447.2306	462.5247	438.2126	371.5529	291.2691	190.8827	111.3223	76.9682	(83)
Total gains	436.3787	509.6730	586.3445	673.6287	738.3279	734.1765	697.6478	634.8111	565.0334	484.5220	427.8316	411.4111	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	60.8123	60.9708	61.1270	61.8714	62.0128	62.6791	62.6791	62.8041	62.4208	62.0128	61.7276	61.4322	
alpha	5.0542	5.0647	5.0751	5.1248	5.1342	5.1786	5.1786	5.1869	5.1614	5.1342	5.1152	5.0955	
util living area	0.9988	0.9971	0.9912	0.9668	0.8868	0.7204	0.5520	0.6222	0.8745	0.9837	0.9974	0.9991	(86)
MIT	19.7132	19.8656	20.1256	20.4781	20.7810	20.9478	20.9892	20.9808	20.8518	20.4567	20.0224	19.6891	(87)
Th 2	19.9667	19.9691	19.9715	19.9826	19.9847	19.9944	19.9944	19.9962	19.9906	19.9847	19.9805	19.9761	(88)
util rest of house	0.9984	0.9960	0.9880	0.9537	0.8437	0.6305	0.4326	0.4992	0.8098	0.9752	0.9963	0.9988	(89)
MIT 2	18.7907	18.9446	19.2049	19.5582	19.8358	19.9704	19.9916	19.9906	19.9059	19.5439	19.1106	18.7741	(90)
Living area fraction									FLA = Living area / (4) =				0.1952 (91)
MIT	18.9708	19.1244	19.3846	19.7378	20.0204	20.1612	20.1864	20.1839	20.0905	19.7221	19.2886	18.9527	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9708	19.1244	19.3846	19.7378	20.0204	20.1612	20.1864	20.1839	20.0905	19.7221	19.2886	18.9527	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9949	0.9855	0.9498	0.8454	0.6465	0.4561	0.5234	0.8173	0.9722	0.9953	0.9984	(94)
Useful gains	435.4138	507.0564	577.8607	639.8210	624.1999	474.6521	318.2179	332.2296	461.8263	471.0752	425.8139	410.7366	(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	1355.0030	1310.3625	1183.9070	983.8534	753.5979	498.3360	321.3748	338.4027	539.0334	826.2155	1109.0533	1348.8196	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	684.1743	539.8217	450.8984	247.7034	96.2722	0.0000	0.0000	0.0000	0.0000	264.2243	491.9321	697.9337	(98)
Space heating												3472.9605	(98)
Space heating per m2												42.9397	(99)
													(98) / (4) =

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	842.3326	663.1129	679.6796	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8844	0.9377	0.9110	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	744.9348	621.8233	619.1614	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	950.8066	906.2061	834.3692	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	148.2277	211.5807	160.1146	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												519.9231	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.0569	52.8952	40.0287	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											129.9808 (107)	
Space cooling per m2											1.6071 (108)	
Energy for space heating											42.9397 (99)	
Energy for space cooling											1.6071 (108)	
Total											44.5468 (109)	
Target Fabric Energy Efficiency (TFEE)											51.2 (109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Moresby End-Terrace		Issued on Date	15/10/2021	
Assessment Reference	1	Prop Type Ref			
Property	Plot 059, Chipping Lane , Longridge , PR3				
SAP Rating	84 B	DER	16.86	TER	17.52
Environmental	87 B	% DER<TER	3.74		
CO₂ Emissions (t/year)	1.22	DFEE	44.25	TFEE	48.07
General Requirements Compliance	Pass	% DFEE<TFEE	7.95		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

End-Terrace House, total floor area 81 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) 17.52 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.86 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.41 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Ideal LOGIC COMBI ESP1 35

Combi boiler

Efficiency: 89.6% 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

Not applicable

9 Summertime temperature

Overheating risk (West Pennines (England)):Not significant OK

Based on:

Overshading:

Average

Windows facing North East: 3.71 m², No overhang

Windows facing South East: 5.34 m², No overhang

Windows facing South West: 5.35 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.11 W/m²K

Door U-value 1.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	40.4400 (1b)	x 2.3300 (2b)	= 94.2252 (1b) - (3b)
First floor	40.4400 (1c)	x 2.5600 (2c)	= 103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (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) = 0.2023 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4528 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3849 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4907	0.4811	0.4715	0.4233	0.4137	0.3656	0.3656	0.3560	0.3849	0.4137	0.4330	0.4522 (22b)
Effective ac	0.6204	0.6157	0.6111	0.5896	0.5856	0.5668	0.5668	0.5634	0.5741	0.5856	0.5937	0.6022 (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					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			14.4000	1.3347	19.2200		(27)					
150mm Platinum			40.4400	0.1500	6.0660		(28a)					
50mm A. Platinum	87.7100	16.3700	71.3400	0.2700	19.2618		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m ²)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	50.9662	(33)					
E-WM-22			40.5200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.8300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2642 (36)					
Total fabric heat loss						(33) + (36) =	59.2304 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.4854	Feb 40.1804	Mar 39.8813	Apr 38.4768	May 38.2140	Jun 36.9907	Jul 36.9907	Aug 36.7641	Sep 37.4619	Oct 38.2140	Nov 38.7456	Dec 39.3014 (38)
Heat transfer coeff	99.7159	99.4108	99.1117	97.7072	97.4444	96.2211	96.2211	95.9945	96.6923	97.4444	97.9760	98.5318 (39)
Average = Sum(39)m / 12 =												97.7059 (39)
HLP	Jan 1.2329	Feb 1.2291	Mar 1.2254	Apr 1.2081	May 1.2048	Jun 1.1897	Jul 1.1897	Aug 1.1869	Sep 1.1955	Oct 1.2048	Nov 1.2114	Dec 1.2182 (40)
HLP (average)												1.2080 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy conte	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Energy content (annual)												Total = Sum(45)m = 1464.5812 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	14.1210	12.7398	14.0688	13.5744	13.9973	13.5117	13.9409	13.9775	13.5459	14.0392	13.6335	14.1095 (61)
Total heat required for water heating calculated for each month												
	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640 (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												
	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640 (64)
Total per year (kWh/year) = Sum(64)m =												1629.8406 (64)
Heat gains from water heating, kWh/month												
	54.0190	47.3427	49.0840	43.1199	41.6176	36.2711	33.9656	38.4711	38.7809	44.7586	48.4346	52.4230 (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	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1834	17.9267	14.5790	11.0372	8.2504	6.9654	7.5263	9.7830	13.1307	16.6725	19.4593	20.7443 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967 (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)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738 (71)
Water heating gains (Table 5)	72.6061	70.4504	65.9732	58.8887	55.9377	50.3766	45.6527	51.7084	53.8623	60.1594	67.2703	70.4610 (72)
Total internal gains	377.2496	375.1333	361.5222	339.5782	317.2913	295.8311	281.9052	287.9215	299.2093	321.3659	346.8127	365.9024 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	α Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	3.7100	11.2829	0.7100	0.7000	0.7700	14.4174 (75)						
Southeast	5.3400	36.7938	0.7100	0.7000	0.7700	67.6715 (77)						
Southwest	5.3500	36.7938	0.7100	0.7000	0.7700	67.7982 (79)						
Solar gains	149.8871	260.1021	368.6031	478.0379	554.9030	559.4503	535.8074	477.1540	406.2956	290.8979	180.4023	127.7078 (83)
Total gains	527.1367	635.2354	730.1253	817.6161	872.1942	855.2814	817.7127	765.0755	705.5049	612.2638	527.2150	493.6102 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hi} (C)	21.0000 (85)											
Utilisation factor for gains for living area, u_{li} , m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.9243	46.0652	46.2042	46.8684	46.9948	47.5923	47.5923	47.7046	47.3603	46.9948	46.7398	46.4762
alpha	4.0616	4.0710	4.0803	4.1246	4.1330	4.1728	4.1728	4.1803	4.1574	4.1330	4.1160	4.0984
util living area	0.9936	0.9859	0.9679	0.9206	0.8203	0.6574	0.5012	0.5511	0.7830	0.9467	0.9876	0.9951 (86)
MIT	19.4749	19.6973	20.0226	20.4231	20.7436	20.9278	20.9817	20.9731	20.8454	20.4170	19.8710	19.4398 (87)
Th 2	19.8938	19.8968	19.8997	19.9136	19.9162	19.9283	19.9283	19.9305	19.9236	19.9162	19.9109	19.9054 (88)
util rest of house	0.9918	0.9820	0.9588	0.8976	0.7693	0.5689	0.3868	0.4346	0.7063	0.9263	0.9835	0.9937 (89)
MIT 2	17.8740	18.1987	18.6689	19.2404	19.6609	19.8767	19.9205	19.9179	19.7959	19.2456	18.4628	17.8307 (90)
Living area fraction									FLA = Living area / (4) =			0.1952 (91)
MIT	18.1866	18.4913	18.9332	19.4713	19.8723	20.0819	20.1277	20.1239	20.0008	19.4743	18.7378	18.1448 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.0366	18.3413	18.7832	19.3213	19.7223	19.9319	19.9777	19.9739	19.8508	19.3243	18.5878	17.9948 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9872	0.9740	0.9463	0.8820	0.7588	0.5692	0.3923	0.4396	0.7004	0.9115	0.9761	0.9899 (94)
Useful gains	520.3766	618.7084	690.9174	721.1026	661.7982	486.8448	320.8028	336.3509	494.1280	558.0961	514.5982	488.6331 (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	1369.7529	1336.2066	1217.4050	1018.2329	781.7256	513.0394	325.0050	343.0778	556.0543	850.1322	1125.5245	1359.2283 (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	631.9360	482.1588	391.7068	213.9339	89.2260	0.0000	0.0000	0.0000	0.0000	217.2748	439.8669	647.7229 (98)
Space heating												3113.8260 (98)
Space heating per m2										(98) / (4) =		778.4565 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3440.6918 (211)
Space heating requirement	631.9360	482.1588	391.7068	213.9339	89.2260	0.0000	0.0000	0.0000	0.0000	217.2748	439.8669	647.7229	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	698.2718	532.7721	432.8252	236.3910	98.5923	0.0000	0.0000	0.0000	0.0000	240.0827	486.0408	715.7159	(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	165.9667	145.5450	151.1120	133.0519	128.6388	112.4386	105.6112	119.1705	119.9952	138.0957	149.0508	161.1640	(64)
Efficiency of water heater (217)m	89.8152	89.7373	89.5858	89.2456	88.5828	87.3000	87.3000	87.3000	87.3000	89.2290	89.6681	89.8438	(216)
Fuel for water heating, kWh/month	184.7869	162.1901	168.6784	149.0851	145.2188	128.7957	120.9750	136.5069	137.4516	154.7655	166.2250	179.3823	(219)
Water heating fuel used													1834.0612 (219)
Annual totals kWh/year													
Space heating fuel - main system													3440.6918 (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)													356.4445 (232)
Total delivered energy for all uses													5706.1975 (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	3440.6918	0.2160	743.1894	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1834.0612	0.2160	396.1572	(264)
Space and water heating			1139.3466	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	356.4445	0.5190	184.9947	(268)
Total CO2, kg/year			1363.2663	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.8600	(273)

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

DER			16.8600	ZC1
Total Floor Area		TFA	80.8800	
Assumed number of occupants		N	2.4793	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.2117	ZC2
CO2 emissions from cooking, equation (L16)			2.2070	ZC3
Total CO2 emissions			35.2787	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			35.2787	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4017 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			14.4000	1.3258	19.0909		(27)					
150mm Platinum			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinum	87.7100	16.3700	71.3400	0.1800	12.8412		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m ²)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		44.4165 (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)							9.1311 (36)					
Total fabric heat loss						(33) + (36) =	53.5476 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	92.3607	92.1206	91.8852	90.7796	90.5728	89.6098	89.6098	89.4315	89.9808	90.5728	90.9912	91.4287 (39)
Average = Sum(39)m / 12 =												90.7786 (39)
HLP	Jan 1.1419	Feb 1.1390	Mar 1.1361	Apr 1.1224	May 1.1198	Jun 1.1079	Jul 1.1079	Aug 1.1057	Sep 1.1125	Oct 1.1198	Nov 1.1250	Dec 1.1304 (40)
HLP (average)												1.1224 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (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												

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Combi 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	0.0000	0.0000 (57)
	50.9589	45.4150	48.3835	44.9866	44.5887	41.3142	42.6913	44.5887	44.9866	48.3835	48.6590	50.9589	50.9589	(61)
Total heat required for water heating calculated for each month														
	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	198.0134	(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	0.0000	(63)
	Solar input (sum of months) = Sum(63)m =												0.0000 (63)	
Output from w/h														
	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	198.0134	(64)
	Total per year (kWh/year) = Sum(64)m =												2020.4962 (64)	
Heat gains from water heating, kWh/month														
	63.2284	55.5115	57.6627	50.9729	49.2655	43.2218	41.1532	46.1239	46.6411	53.3447	57.1910	61.6353	61.6353	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(66)
	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	20.1834	17.9267	14.5790	11.0372	8.2504	6.9654	7.5263	9.7830	13.1307	16.6725	19.4593	20.7443	20.7443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)														
	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table b)														
	84.9845	82.6064	77.5037	70.7957	66.2171	60.0302	55.3135	61.9945	64.7793	71.6998	79.4320	82.8432	82.8432	(72)
Total internal gains	389.6279	387.2893	373.0527	350.4852	327.5707	305.4848	291.5660	298.2076	310.1262	332.9063	358.9743	378.2846	378.2846	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains								
	m2	Table 5a	Specific data	Specific data	factor	W								
		W/m2	or Table 6b	or Table 6c	Table 6d									
Northeast	3.7100	11.2829	0.6300	0.7000	0.7700	12.7929 (75)								
Southeast	5.3400	36.7938	0.6300	0.7000	0.7700	60.0466 (77)								
Southwest	5.3500	36.7938	0.6300	0.7000	0.7700	60.1590 (79)								
Solar gains	132.9984	230.7948	327.0704	424.1745	492.3787	496.4136	475.4348	423.3902	360.5158	258.1207	160.0753	113.3182	113.3182	(83)
Total gains	522.6263	618.0841	700.1231	774.6597	819.9493	801.8984	767.0008	721.5977	670.6420	591.0270	519.0496	491.6028	491.6028	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)	
Utilisation factor for gains for living area, nil, m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	60.8123	60.9708	61.1270	61.8714	62.0128	62.6791	62.6791	62.8041	62.4208	62.0128	61.7276	61.4322	61.4322	
alpha	5.0542	5.0647	5.0751	5.1248	5.1342	5.1786	5.1786	5.1869	5.1614	5.1342	5.1152	5.0955	5.0955	
util living area	0.9972	0.9930	0.9815	0.9442	0.8480	0.6741	0.5060	0.5564	0.8038	0.9639	0.9938	0.9979	0.9979	(86)
MIT	19.8124	19.9885	20.2490	20.5717	20.8284	20.9615	20.9927	20.9884	20.9043	20.5653	20.1264	19.7818	19.7818	(87)
Th 2	19.9667	19.9691	19.9715	19.9826	19.9847	19.9944	19.9944	19.9962	19.9906	19.9847	19.9805	19.9761	19.9761	(88)
util rest of house	0.9963	0.9907	0.9751	0.9245	0.7977	0.5846	0.3946	0.4419	0.7261	0.9471	0.9913	0.9973	0.9973	(89)
MIT 2	18.3890	18.6470	19.0250	19.4871	19.8200	19.9693	19.9917	19.9915	19.9168	19.4884	18.8572	18.3510	18.3510	(90)
Living area fraction	fLA = Living area / (4) =												0.1952 (91)	
MIT	18.6669	18.9089	19.2639	19.6988	20.0169	20.1630	20.1872	20.1861	20.1096	19.6986	19.1049	18.6303	18.6303	(92)
Temperature adjustment														
adjusted MIT	18.6669	18.9089	19.2639	19.6988	20.0169	20.1630	20.1872	20.1861	20.1096	19.6986	19.1049	18.6303	18.6303	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9945	0.9873	0.9693	0.9178	0.7995	0.6005	0.4164	0.4643	0.7363	0.9410	0.9882	0.9959	(94)	
Useful gains	519.7615	610.2552	678.6081	710.9784	655.5821	481.5162	319.3681	335.0170	493.8139	556.1569	512.9280	489.5819	(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														
	1326.9376	1290.5083	1172.8169	980.3133	753.2849	498.5017	321.4445	338.5992	540.7478	824.0884	1092.3448	1319.3435	(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	600.5390	457.1301	367.6914	193.9211	72.6909	0.0000	0.0000	0.0000	0.0000	199.3410	417.1801	617.3427	(98)	
Space heating	2925.8363 (98)												(98) / (4) =	36.1750 (99)
Space heating per m2														

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													3132.5870 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	600.5390	457.1301	367.6914	193.9211	72.6909	0.0000	0.0000	0.0000	0.0000	199.3410	417.1801	617.3427	(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)	642.9754	489.4327	393.6738	207.6243	77.8275	0.0000	0.0000	0.0000	0.0000	213.4272	446.6597	660.9665	(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	202.8046	178.2203	185.4266	164.4641	159.2303	140.2411	134.3617	149.7818	151.4360	172.4400	184.0763	198.0134	(64)
Efficiency of water heater (217)m	87.6179	87.3192	86.7424	85.4668	83.2140	80.3000	80.3000	80.3000	80.3000	85.4169	87.0480	87.7205	(217)
Fuel for water heating, kWh/month	231.4649	204.1020	213.7669	192.4303	191.3503	174.6465	167.3246	186.5277	188.5877	201.8805	211.4653	225.7322	(219)
Water heating fuel used													2389.2789 (219)
Annual totals kWh/year													
Space heating fuel - main system													3132.5870 (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)													356.4445 (232)
Total delivered energy for all uses													5953.3104 (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	3132.5870	0.2160	676.6388 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2389.2789	0.2160	516.0842 (264)
Space and water heating			1192.7230 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	356.4445	0.5190	184.9947 (268)
Total CO2, kg/m2/year			1416.6427 (272)
Emissions per m2 for space and water heating			14.7468 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2873 (272b)
Emissions per m2 for pumps and fans			0.4813 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7468 * 1.00) + 2.2873 + 0.4813, rounded to 2 d.p.			17.5200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.4400 (1b)	2.3300 (2b)	94.2252 (1b) - (3b)
First floor	40.4400 (1c)	2.5600 (2c)	103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =				30.0000 / (5) =	0.1517 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.4022 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3419 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4359	0.4273	0.4188	0.3761	0.3675	0.3248	0.3248	0.3162	0.3419	0.3675	0.3846	0.4017 (22b)
Effective ac	0.5950	0.5913	0.5877	0.5707	0.5675	0.5527	0.5527	0.5500	0.5584	0.5675	0.5740	0.5807 (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					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			14.4000	1.3347	19.2200		(27)					
150mm Platinum			40.4400	0.1500	6.0660		(28a)					
50mm A. Platinum	87.7100	16.3700	71.3400	0.2700	19.2618		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m ²)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	50.9662	(33)					
E-WM-22			40.5200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.8300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2642 (36)					
Total fabric heat loss						(33) + (36) =	59.2304 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8285	Feb 38.5878	Mar 38.3518	Apr 37.2435	May 37.0361	Jun 36.0708	Jul 36.0708	Aug 35.8920	Sep 36.4426	Oct 37.0361	Nov 37.4556	Dec 37.8942 (38)
Heat transfer coeff	98.0589	97.8182	97.5822	96.4739	96.2665	95.3012	95.3012	95.1225	95.6730	96.2665	96.6860	97.1246 (39)
Average = Sum(39)m / 12 =												96.4729 (39)
HLP	Jan 1.2124	Feb 1.2094	Mar 1.2065	Apr 1.1928	May 1.1902	Jun 1.1783	Jul 1.1783	Aug 1.1761	Sep 1.1829	Oct 1.1902	Nov 1.1954	Dec 1.2008 (40)
HLP (average)												1.1928 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy conte	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Energy content (annual)												Total = Sum(45)m = 1464.5812 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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)
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	0.0000	(59)
Heat gains from water heating, kWh/month	32.2672	28.2211	29.1217	25.3890	24.3613	21.0220	19.4799	22.3535	22.6205	26.3620	28.7762	31.2491	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1834	17.9267	14.5790	11.0372	8.2504	6.9654	7.5263	9.7830	13.1307	16.6725	19.4593	20.7443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(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 c.g. evaporation (negative values) (Table 5)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table 5)	43.3699	41.9957	39.1420	35.2625	32.7437	29.1972	26.1827	30.0451	31.4174	35.4328	39.9669	42.0015	(72)
Total internal gains	345.0134	343.6786	331.6911	311.9519	291.0973	271.6518	259.4352	263.2582	273.7643	293.6393	316.5093	334.4428	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	3.7100	11.2829	0.7100	0.7000	0.7700	14.4174	(75)						
Southeast	5.3400	36.7938	0.7100	0.7000	0.7700	67.6715	(77)						
Southwest	5.3500	36.7938	0.7100	0.7000	0.7700	67.7982	(79)						
Solar gains	149.8871	260.1021	368.6031	478.0379	554.9030	559.4503	535.8074	477.1540	406.2956	290.8979	180.4023	127.7078	(83)
Total gains	494.9005	603.7806	700.2942	789.9898	846.0003	831.1020	795.2427	740.4122	680.0599	584.5372	496.9116	462.1507	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nll,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
tau	46.7003	46.8152	46.9284	47.4676	47.5698	48.0516	48.0516	48.1420	47.8649	47.5698	47.3634	47.1495	(86)
alpha	4.1134	4.1210	4.1286	4.1645	4.1713	4.2034	4.2034	4.2095	4.1910	4.1713	4.1576	4.1433	(87)
util living area	0.9949	0.9880	0.9715	0.9267	0.8288	0.6674	0.5097	0.5627	0.7952	0.9530	0.9899	0.9961	(88)
MIT	19.4633	19.6865	20.0131	20.4135	20.7383	20.9253	20.9811	20.9717	20.8388	20.4013	19.8526	19.4245	(89)
Th 2	19.9101	19.9125	19.9148	19.9258	19.9278	19.9374	19.9374	19.9392	19.9337	19.9278	19.9237	19.9193	(90)
util rest of house	0.9935	0.9847	0.9634	0.9050	0.7792	0.5793	0.3948	0.4456	0.7205	0.9347	0.9865	0.9951	(91)
MIT 2	18.5159	18.7391	19.0625	19.4559	19.7487	19.9007	19.9319	19.9300	19.8417	19.4538	18.9141	18.4843	(92)
Living area fraction										FLA = Living area / (4) =		0.1952	(91)
MIT	18.7008	18.9240	19.2481	19.6428	19.9419	20.1007	20.1367	20.1334	20.0363	19.6388	19.0973	18.6678	(92)
Temperature adjustment												0.0000	(93)
adjusted MIT	18.7008	18.9240	19.2481	19.6428	19.9419	20.1007	20.1367	20.1334	20.0363	19.6388	19.0973	18.6678	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9807	0.9570	0.8982	0.7799	0.5938	0.4171	0.4681	0.7286	0.9284	0.9829	0.9933	(94)
Useful gains	490.5742	592.1200	670.1625	709.5623	659.8007	493.5378	331.7299	346.5582	495.5072	542.6897	488.4352	459.0461	(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	1412.1321	1371.8046	1243.9853	1036.4022	793.4163	524.2249	337.0536	355.1299	567.9485	870.1326	1159.9753	1405.1820	(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	685.6391	523.9480	426.9242	235.3248	99.4100	0.0000	0.0000	0.0000	0.0000	243.6175	483.5089	703.9251	(98)
Space heating												3402.2975	(98)
Space heating per m2										(98) / (4) =		42.0660	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Useful gains	0.0000	0.0000	0.0000	0.0000	0.0000	895.8315	705.2290	722.9307	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8704	0.9234	0.9024	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	779.7033	651.2118	652.3981	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1064.0962	1020.2780	957.7991	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	204.7629	274.5853	227.2183	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											706.5665 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	51.1907	68.6463	56.8046	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											176.6416 (107)
Space cooling per m2											2.1840 (108)
Energy for space heating											42.0660 (99)
Energy for space cooling											2.1840 (108)
Total											44.2500 (109)
Dwelling Fabric Energy Efficiency (DFEE)											44.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	40.4400 (1b)	x 2.3300 (2b)	= 94.2252 (1b) - (3b)
First floor	40.4400 (1c)	x 2.5600 (2c)	= 103.5264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.7516 (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) =					30.0000 / (5) = 0.1517 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4017 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3414 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3414	0.3671	0.3841	0.4012 (22b)
	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			14.4000	1.3258	19.0909		(27)					
150mm Platinum			40.4400	0.1300	5.2572		(28a)					
50mm A. Platinum	87.7100	16.3700	71.3400	0.1800	12.8412		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1300	5.2572		(30)					
Total net area of external elements Aum(A, m ²)			168.5900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 44.4165		(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)							9.1311 (36)					
Total fabric heat loss							(33) + (36) = 53.5476 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.8131	Feb 38.5730	Mar 38.3376	Apr 37.2320	May 37.0252	Jun 36.0623	Jul 36.0623	Aug 35.8839	Sep 36.4332	Oct 37.0252	Nov 37.4436	Dec 37.8611 (38)
Heat transfer coeff	92.3607	92.1206	91.8852	90.7796	90.5728	89.6098	89.6098	89.4315	89.9808	90.5728	90.9912	91.4287 (39)
Average = Sum(39)m / 12 =												90.7786 (39)
HLP	Jan 1.1419	Feb 1.1390	Mar 1.1361	Apr 1.1224	May 1.1198	Jun 1.1079	Jul 1.1079	Aug 1.1057	Sep 1.1125	Oct 1.1198	Nov 1.1250	Dec 1.1304 (40)
HLP (average)												1.1224 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy conte	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Energy content (annual)												Total = Sum(45)m = 1464.5812 (45)
Distribution loss (46)m = 0.15 x (45)m												
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												
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 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.1524	59.8067	48.9659	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											150.9250 (107)	
Space cooling per m2											1.8660 (108)	
Energy for space heating											39.9365 (99)	
Energy for space cooling											1.8660 (108)	
Total											41.8026 (109)	
Target Fabric Energy Efficiency (TFEE)											48.1 (109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Thornton Detached		Issued on Date	15/10/2021	
Assessment Reference	1	Prop Type Ref			
Property	Plot 080, Chipping Lane , Longridge , PR3				
SAP Rating	84 B	DER	16.93	TER	17.45
Environmental	85 B	% DER<TER	2.96		
CO₂ Emissions (t/year)	1.70	DFEE	51.11	TFEE	55.60
General Requirements Compliance	Pass	% DFEE<TFEE	8.08		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Detached House, total floor area 110 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) 17.45 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.93 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 51.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.70 (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: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% 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

Not applicable

9 Summertime temperature

Overheating risk (West Pennines (England)):Not significant OK

Based on:

Overshading: Average
Windows facing South East: 8.87 m², No overhang
Windows facing North West: 10.00 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Thermal bridging y-value 0.039 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	55.1100 (1b)	x 2.3100 (2b)	= 127.3041 (1b) - (3b)
First floor	55.1100 (1c)	x 2.5600 (2c)	= 141.0816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.2200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 268.3857 (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					5 * 10 = 50.0000 (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) =					50.0000 / (5) = 0.1863 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4368 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3713 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4734	0.4641	0.4548	0.4084	0.3991	0.3527	0.3527	0.3434	0.3713	0.3991	0.4177	0.4363 (22b)
Effective ac	0.6120	0.6077	0.6034	0.5834	0.5797	0.5622	0.5622	0.5590	0.5689	0.5797	0.5872	0.5952 (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					
Opening Type 1 (Uw = 1.41)			18.8700	1.3347	25.1862		(27)					
Opening Type 4			1.9700	1.0000	1.9700		(26)					
Opening Type 12			1.9700	1.7000	3.3490		(26a)					
150mm TE Platinum GF			55.1100	0.1500	8.2665		(28a)					
50mm Aireflex Plat	145.6100	22.8100	122.8000	0.2700	33.1560		(29a)					
400mm Mineral Wool	55.1500		55.1500	0.1100	6.0665		(30)					
Total net area of external elements Aum(A, m ²)			255.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 77.9942		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							152.4500 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9377 (36)					
Total fabric heat loss							(33) + (36) = 87.9319 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 54.2071	Feb 53.8218	Mar 53.4441	Apr 51.6700	May 51.3381	Jun 49.7929	Jul 49.7929	Aug 49.5067	Sep 50.3881	Oct 51.3381	Nov 52.0095	Dec 52.7116 (38)
Heat transfer coeff	142.1390	141.7537	141.3760	139.6019	139.2699	137.7248	137.7248	137.4386	138.3199	139.2699	139.9414	140.6434 (39)
Average = Sum(39)m / 12 =												139.6003 (39)
HLP	Jan 1.2896	Feb 1.2861	Mar 1.2827	Apr 1.2666	May 1.2636	Jun 1.2495	Jul 1.2495	Aug 1.2469	Sep 1.2549	Oct 1.2636	Nov 1.2697	Dec 1.2760 (40)
HLP (average)												1.2666 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.8161 (42)
Average daily hot water use (litres/day)												101.0833 (43)
Daily hot water use	111.1917	107.1483	103.1050	99.0617	95.0183	90.9750	90.9750	95.0183	99.0617	103.1050	107.1483	111.1917 (44)
Energy content	164.8940	144.2174	148.8194	129.7444	124.4928	107.4278	99.5477	114.2324	115.5967	134.7168	147.0539	159.6911 (45)
Energy content (annual)												Total = Sum(45)m = 1590.4343 (45)
Distribution loss (46)m = 0.15 x (45)m	24.7341	21.6326	22.3229	19.4617	18.6739	16.1142	14.9322	17.1349	17.3395	20.2075	22.0581	23.9537 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.1523	12.7714	14.1137	13.6213	14.0405	13.5474	13.9739	14.0171	13.5876	14.0799	13.6657	14.1398	14.1398	14.1398	14.1398	14.1398	14.1398	14.1398	14.1398	14.1398	14.1398	14.1398	(61)
Total heat required for water heating calculated for each month	179.0463	156.9888	162.9331	143.3656	138.5333	120.9752	113.5216	128.2495	129.1843	148.7967	160.7197	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	(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	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	179.0463	156.9888	162.9331	143.3656	138.5333	120.9752	113.5216	128.2495	129.1843	148.7967	160.7197	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	173.8309	(64)
Heat gains from water heating, kWh/month	58.3653	51.1451	53.0109	46.5453	44.9040	39.1066	36.5931	41.4865	41.8328	48.3133	52.3119	56.6322	56.6322	56.6322	56.6322	56.6322	56.6322	56.6322	56.6322	56.6322	56.6322	56.6322	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9662	22.1747	18.0337	13.6527	10.2055	8.6159	9.3098	12.1013	16.2423	20.6233	24.0705	25.6601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8717	274.6929	267.5836	252.4488	233.3438	215.3879	203.3922	200.5710	207.6803	222.8151	241.9200	259.8760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	(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)	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	(71)
Water heating gains (Table 5)	78.4480	76.1088	71.2512	64.6463	60.3548	54.3147	49.1842	55.7615	58.1011	64.9372	72.6554	76.1186	(72)
Total internal gains	443.5280	441.2186	425.1106	398.9899	372.1463	346.5606	330.1283	336.6758	350.2658	376.6177	406.8880	429.8968	(73)

6. Solar gains

[Jan]	Area	Solar flux	α	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
Southeast	8.8700	36.7938	0.7100	0.7000	0.7700	112.4057	(77)						
Northwest	10.0000	11.2829	0.7100	0.7000	0.7700	38.8608	(81)						
Solar gains	151.2665	270.5708	404.4927	558.6546	678.1942	696.3629	661.7662	569.0568	457.3235	308.2828	183.5331	127.9315	(83)
Total gains	594.7945	711.7893	829.6033	957.6444	1050.3405	1042.9235	991.8945	905.7326	807.5893	684.9005	590.4210	557.8283	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hi} (C)													21.0000	(85)
Utilisation factor for gains for living area, u_{li} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
τ	32.8376	32.9269	33.0149	33.4344	33.5141	33.8901	33.8901	33.9607	33.7443	33.5141	33.3533	33.1868		
α	3.1892	3.1951	3.2010	3.2290	3.2343	3.2593	3.2593	3.2640	3.2496	3.2343	3.2236	3.2125		
util living area	0.9909	0.9832	0.9664	0.9238	0.8368	0.6973	0.5566	0.6149	0.8241	0.9512	0.9850	0.9926	(86)	
MIT	18.8794	19.1177	19.5139	20.0382	20.5020	20.8149	20.9353	20.9095	20.6537	20.0466	19.3711	18.8425	(87)	
Th 2	19.8490	19.8517	19.8544	19.8671	19.8695	19.8806	19.8806	19.8826	19.8763	19.8695	19.8647	19.8597	(88)	
util rest of house	0.9888	0.9795	0.9584	0.9046	0.7934	0.6143	0.4357	0.4952	0.7606	0.9351	0.9809	0.9909	(89)	
MIT 2	17.0257	17.3738	17.9486	18.7031	19.3361	19.7282	19.8460	19.8296	19.5519	18.7297	17.7527	16.9782	(90)	
Living area fraction									$f_{LA} = \text{Living area} / (4) =$				0.1886	(91)
MIT	17.3753	17.7027	18.2439	18.9550	19.5560	19.9332	20.0515	20.0333	19.7597	18.9781	18.0580	17.3298	(92)	
Temperature adjustment													-0.1500	
adjusted MIT	17.2253	17.5527	18.0939	18.8050	19.4060	19.7832	19.9015	19.8833	19.6097	18.8281	17.9080	17.1798	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9813	0.9679	0.9408	0.8809	0.7720	0.6061	0.4381	0.4953	0.7421	0.9141	0.9700	0.9845	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1837.1935	1793.5705	1639.0958	1382.7525	1073.2123	713.8523	454.6937	478.7393	762.0982	1145.9219	1512.4884	1825.5282	(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	932.6223	742.3318	638.8222	388.1774	195.1940	0.0000	0.0000	0.0000	0.0000	386.7471	676.6205	949.6045	(98)
Space heating												4910.1198	(98)
Space heating per m ²										(98) / (4) =		44.5484	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													5425.5467	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	932.6223	742.3318	638.8222	388.1774	195.1940	0.0000	0.0000	0.0000	0.0000	386.7471	676.6205	949.6045	949.6045	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	1030.5219	820.2562	705.8809	428.9253	215.6840	0.0000	0.0000	0.0000	0.0000	427.3449	747.6469	1049.2867	1049.2867	(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	0.0000	(215)
Water heating requirement	179.0463	156.9888	162.9331	143.3656	138.5333	120.9752	113.5216	128.2495	129.1843	148.7967	160.7197	173.8309	173.8309	(64)
Efficiency of water heater (217)m	89.9688	89.9246	89.8308	89.6140	89.1436	87.3000	87.3000	87.3000	87.3000	89.5876	89.8677	87.3000	87.3000	(216)
Fuel for water heating, kWh/month	199.0092	174.5782	181.3777	159.9812	155.4046	138.5741	130.0362	146.9066	147.9775	166.0907	178.8403	193.1677	193.1677	(219)
Water heating fuel used													1971.9440	(219)
Annual totals kWh/year													5425.5467	(211)
Space heating fuel - main system													0.0000	(215)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:													30.0000	(230c)
central heating pump													45.0000	(230e)
main heating flue fan													75.0000	(231)
Total electricity for the above, kWh/year													440.9105	(232)
Electricity for lighting (calculated in Appendix L)													7913.4012	(238)
Total delivered energy for all uses														

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5425.5467	0.2160	1171.9181 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1971.9440	0.2160	425.9399 (264)
Space and water heating			1597.8580 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	440.9105	0.5190	228.8325 (268)
Total CO2, kg/year			1865.6155 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.9300 (273)

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

	TFA	N	EF	
DER				16.9300 ZC1
Total Floor Area	110.2200			
Assumed number of occupants	2.8161			
CO2 emission factor in Table 12 for electricity displaced from grid			0.5190	
CO2 emissions from appliances, equation (L14)				14.6167 ZC2
CO2 emissions from cooking, equation (L16)				1.6929 ZC3
Total CO2 emissions				33.2396 ZC4
Residual CO2 emissions offset from biofuel CHP				0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year				0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation				0.0000 ZC7
Net CO2 emissions				33.2396 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	55.1100 (1b)	2.3100 (2b)	127.3041 (1b) - (3b)
First floor	55.1100 (1c)	2.5600 (2c)	141.0816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.2200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 268.3857 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				40.0000 / (5) =	0.1490 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3990 (18)							
Number of sides sheltered				2	(19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3392 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4325	0.4240	0.4155	0.3731	0.3646	0.3222	0.3222	0.3137	0.3392	0.3646	0.3816	0.3985 (22b)
Effective ac	0.5935	0.5899	0.5863	0.5696	0.5665	0.5519	0.5519	0.5492	0.5575	0.5665	0.5728	0.5794 (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			1.9700	1.0000	1.9700		(26)					
TER Semi-glazed door			1.9700	1.2000	2.3640		(26a)					
TER Opening Type (Uw = 1.40)			18.8700	1.3258	25.0170		(27)					
150mm TE Platinum GF			55.1100	0.1300	7.1643		(28a)					
50mm Aireflex Plat	145.6100	22.8100	122.8000	0.1800	22.1040		(29a)					
400mm Mineral Wool	55.1500		55.1500	0.1300	7.1695		(30)					
Total net area of external elements Aum(A, m ²)			255.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	65.7888	(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)							11.6782 (36)					
Total fabric heat loss							(33) + (36) = 77.4670 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 52.5656	Feb 52.2440	Mar 51.9288	Apr 50.4481	May 50.1711	Jun 48.8815	Jul 48.8815	Aug 48.6427	Sep 49.3783	Oct 50.1711	Nov 50.7315	Dec 51.3174 (38)
Heat transfer coeff	130.0326	129.7110	129.3958	127.9152	127.6382	126.3486	126.3486	126.1098	126.8453	127.6382	128.1986	128.7845 (39)
Average = Sum(39)m / 12 =												127.9139 (39)
HLP	Jan 1.1798	Feb 1.1768	Mar 1.1740	Apr 1.1605	May 1.1580	Jun 1.1463	Jul 1.1463	Aug 1.1442	Sep 1.1508	Oct 1.1580	Nov 1.1631	Dec 1.1684 (40)
HLP (average)												1.1605 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.8161 (42)
Average daily hot water use (litres/day)												101.0833 (43)
Daily hot water use	111.1917	107.1483	103.1050	99.0617	95.0183	90.9750	90.9750	95.0183	99.0617	103.1050	107.1483	111.1917 (44)
Energy content	164.8940	144.2174	148.8194	129.7444	124.4928	107.4278	99.5477	114.2324	115.5967	134.7168	147.0539	159.6911 (45)
Energy content (annual)												Total = Sum(45)m = 1590.4343 (45)
Distribution loss (46)m = 0.15 x (45)m	24.7341	21.6326	22.3229	19.4617	18.6739	16.1142	14.9322	17.1349	17.3395	20.2075	22.0581	23.9537 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	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	48.8523	48.4203	44.8644	46.3599	48.4203	48.8523	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	(61)	
Total heat required for water heating calculated for each month	215.8529	190.2448	199.7783	178.5967	172.9131	152.2922	145.9075	162.6527	164.4490	185.6757	196.3690	210.6500	210.6500	196.3690	185.6757	164.4490	162.6527	145.9075	152.2922	172.9131	178.5967	199.7783	190.2448	215.8529	(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	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	215.8529	190.2448	199.7783	178.5967	172.9131	152.2922	145.9075	162.6527	164.4490	185.6757	196.3690	210.6500	210.6500	196.3690	185.6757	164.4490	162.6527	145.9075	152.2922	172.9131	178.5967	199.7783	190.2448	215.8529	(64)
Heat gains from water heating, kWh/month	67.5670	59.4591	62.2222	55.3531	53.4989	46.9358	44.6896	50.0873	50.6490	57.5331	61.2242	65.8370	65.8370	61.2242	57.5331	50.6490	50.0873	44.6896	46.9358	53.4989	55.3531	62.2222	59.4591	67.5670	(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	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9662	22.1747	18.0337	13.6527	10.2055	8.6159	9.3098	12.1013	16.2423	20.6233	24.0705	25.6601	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8717	274.6929	267.5836	252.4488	233.3438	215.3879	203.3922	200.5710	207.6803	222.8151	241.9200	259.8760	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	(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)	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	(71)	
Water heating gains (Table 5)	90.8158	88.4808	83.6320	76.8793	71.9072	65.1887	60.0666	67.3217	70.3458	77.3294	85.0336	88.4906	(72)	
Total internal gains	455.8958	453.5906	437.4914	411.2229	383.6986	357.4346	341.0107	348.2360	362.5105	389.0099	419.2662	442.2688	(73)	

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	α Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast		8.8700	36.7938	0.6300	0.7000	0.7700	99.7403	(77)					
Northwest		10.0000	11.2829	0.6300	0.7000	0.7700	34.4821	(81)					
Solar gains	134.2224	240.0839	358.9161	495.7076	601.7780	617.8995	587.2010	504.9377	405.7941	273.5467	162.8533	113.5167	(83)
Total gains	590.1182	693.6745	796.4075	906.9304	985.4766	975.3341	928.2117	853.1738	768.3046	662.5565	582.1195	555.7855	(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	58.8634	59.0094	59.1531	59.8378	59.9677	60.5798	60.5798	60.6945	60.3425	59.9677	59.7056	59.4339	59.4339	
alpha	4.9242	4.9340	4.9435	4.9892	4.9978	5.0387	5.0387	5.0463	5.0228	4.9978	4.9804	4.9623	4.9623	
util living area	0.9988	0.9971	0.9916	0.9700	0.9004	0.7477	0.5799	0.6455	0.8832	0.9842	0.9974	0.9991	0.9991	(86)
MIT	19.6592	19.8157	20.0782	20.4319	20.7450	20.9324	20.9850	20.9750	20.8325	20.4254	19.9788	19.6342	19.6342	(87)
Th 2	19.9362	19.9386	19.9409	19.9517	19.9537	19.9632	19.9632	19.9649	19.9595	19.9537	19.9496	19.9453	19.9453	(88)
util rest of house	0.9984	0.9961	0.9885	0.9579	0.8598	0.6567	0.4529	0.5169	0.8198	0.9758	0.9964	0.9988	0.9988	(89)
MIT 2	18.1438	18.3741	18.7580	19.2729	19.6968	19.9168	19.9575	19.9542	19.8181	19.2716	18.6208	18.1137	18.1137	(90)
Living area fraction										flA = Living area / (4) =		0.1886	0.1886	(91)
MIT	18.4296	18.6460	19.0070	19.4915	19.8945	20.1084	20.1513	20.1468	20.0094	19.4893	18.8770	18.4005	18.4005	(92)
Temperature adjustment												0.0000	0.0000	(93)
adjusted MIT	18.4296	18.6460	19.0070	19.4915	19.8945	20.1084	20.1513	20.1468	20.0094	19.4893	18.8770	18.4005	18.4005	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	588.6242	689.6394	784.0746	862.4317	844.6138	654.1163	442.6790	461.5071	632.7067	643.0426	579.0039	554.7356	554.7356	(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	4.2000	(96)
Heat loss rate W	1837.3114	1783.0102	1618.3574	1354.8188	1045.9307	695.9736	448.7031	472.5032	749.5814	1134.6093	1509.7891	1828.7999	1828.7999	(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	1.0000	(97a)
Space heating kWh	929.0233	734.7452	620.7064	354.5187	149.7798	0.0000	0.0000	0.0000	0.0000	365.7257	670.1654	947.9039	947.9039	(98)
Space heating per m ²												4772.5682	4772.5682	(98)
										(98) / (4) =		43.3004	43.3004	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													5109.8161 (211)
Space heating requirement	929.0233	734.7452	620.7064	354.5187	149.7798	0.0000	0.0000	0.0000	0.0000	365.7257	670.1654	947.9039	(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)	994.6716	786.6650	664.5678	379.5703	160.3638	0.0000	0.0000	0.0000	0.0000	391.5692	717.5218	1014.8864	(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	215.8529	190.2448	199.7783	178.5967	172.9131	152.2922	145.9075	162.6527	164.4490	185.6757	196.3690	210.6500	(64)
Efficiency of water heater (217)m	88.3059	88.1204	87.7137	86.7449	84.6920	80.3000	80.3000	80.3000	80.3000	86.7268	87.8947	80.3000	(216)
Fuel for water heating, kWh/month	244.4377	215.8918	227.7617	205.8873	204.1671	189.6540	181.7030	202.5563	204.7933	214.0927	223.4139	238.3488	(219)
Water heating fuel used													2552.7077 (219)
Annual totals kWh/year													
Space heating fuel - main system													5109.8161 (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)													440.9105 (232)
Total delivered energy for all uses													8178.4342 (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	5109.8161	0.2160	1103.7203 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2552.7077	0.2160	551.3849 (264)
Space and water heating			1655.1051 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	440.9105	0.5190	228.8325 (268)
Total CO2, kg/m2/year			1922.8627 (272)
Emissions per m2 for space and water heating			15.0164 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0761 (272b)
Emissions per m2 for pumps and fans			0.3532 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0164 * 1.00) + 2.0761 + 0.3532, rounded to 2 d.p.			17.4500 (273)