

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	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 132.6240 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1508 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.4013 (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) =	0.3411 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4349	0.4264	0.4179	0.3752	0.3667	0.3241	0.3241	0.3155	0.3411	0.3667	0.3837	0.4008 (22b)
	0.5946	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803 (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	R-value kJ/m ² K	A x K kJ/K					
Opening Type 1			2.1200	1.0000	2.1200		(26)					
Opening Type 2 (Uw = 1.41)			8.6200	1.3347	11.5053		(27)					
150mm TE Platinum			55.2600	0.1500	8.2890		(28a)					
50mm Alreflex	51.9100	10.7400	41.1700	0.2700	11.1159		(29a)					
400mm Mineral Wool	55.2600		55.2600	0.1100	6.0786		(30)					
Total net area of external elements Aum(A, m ²)			162.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.1088	(33)					
Party wall			19.8700	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							211.5000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6957 (36)					
Total fabric heat loss						(33) + (36) =	46.8045 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.0221	25.8613	25.7038	24.9638	24.8254	24.1809	24.1809	24.0615	24.4291	24.8254	25.1055	25.3983 (38)
Heat transfer coeff	72.8266	72.6659	72.5083	71.7683	71.6299	70.9854	70.9854	70.8660	71.2336	71.6299	71.9100	72.2028 (39)
Average = Sum(39)m / 12 =												71.7677 (39)
HLP	1.3179	1.3150	1.3121	1.2987	1.2962	1.2846	1.2846	1.2824	1.2891	1.2962	1.3013	1.3066 (40)
HLP (average)												1.2987 (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												1.8450 (42)
Average daily hot water use (litres/day)												78.0181 (43)
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy content (annual)	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1227.5289 (45)
Water storage loss:												
Total storage loss	19.0903	16.6965	17.2293	15.0209	14.4129	12.4372	11.5249	13.2250	13.3830	15.5966	17.0249	18.4879 (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)

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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	(57)
Total heat required for water heating calculated for each month	14.0187	12.6462	13.9759	13.4966	13.9257	13.4525	13.8860	13.9117	13.4765	13.9551	13.5381	14.0104	13.9551	13.5381	14.0104	13.9551	13.5381	(61)
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	(62)
Output from w/h	141.2872	123.9560	128.8377	113.6358	110.0117	96.3675	90.7189	102.0786	102.6964	117.9323	127.0372	137.2632	102.0786	102.6964	117.9323	127.0372	137.2632	(63)
Heat gains from water heating, kWh/month	45.8214	40.1721	41.6855	36.6704	35.4300	30.9323	29.0184	32.7934	33.0347	38.0612	41.1230	44.4841	32.7934	33.0347	38.0612	41.1230	44.4841	(64)
																		(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	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0372	13.3559	10.8618	8.2230	6.1468	5.1894	5.6073	7.2886	9.7828	12.4215	14.4977	15.4551	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.8554	162.5246	158.3183	149.3637	138.0600	127.4362	120.3389	118.6697	122.8759	131.8306	143.1342	153.7581	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	(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)	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	(71)
Water heating gains (Table b)	61.5880	59.7799	56.0289	50.9312	47.6210	42.9616	39.0033	44.0772	45.8816	51.1575	57.1153	59.7905	(72)
Total internal gains	291.1552	289.3350	278.8836	262.1925	245.5025	229.2618	218.6241	223.7101	232.2149	249.0842	268.4218	282.6783	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	6.1400	10.6334	0.7100	0.7000	0.7700	22.4869 (74)
South	2.4800	46.7521	0.7100	0.7000	0.7700	39.9339 (78)

Solar gains	62.4208	108.3751	156.3326	211.4515	256.1234	263.5747	250.1818	214.8880	174.8240	121.6962	75.0758	53.2528	(83)
Total gains	353.5760	397.7101	435.2162	473.6440	501.6259	492.8365	468.8059	438.5981	407.0389	370.7803	343.4977	335.9311	(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	44.5788	44.6774	44.7745	45.2362	45.3236	45.7351	45.7351	45.8121	45.5757	45.3236	45.1471	44.9640	
alpha	3.9719	3.9785	3.9850	4.0157	4.0216	4.0490	4.0490	4.0541	4.0384	4.0216	4.0098	3.9976	
util living area	0.9947	0.9909	0.9823	0.9582	0.8961	0.7680	0.6169	0.6695	0.8692	0.9687	0.9909	0.9957	(86)
MIT	19.3834	19.5484	19.8321	20.2218	20.5931	20.8573	20.9565	20.9391	20.7409	20.2754	19.7632	19.3535	(87)
Th 2	19.8268	19.8291	19.8313	19.8418	19.8438	19.8529	19.8529	19.8546	19.8494	19.8438	19.8398	19.8357	(88)
util rest of house	0.9932	0.9882	0.9767	0.9434	0.8563	0.6778	0.4779	0.5337	0.8040	0.9548	0.9877	0.9945	(89)
MIT 2	17.6916	17.9332	18.3464	18.9113	19.4207	19.7459	19.8340	19.8250	19.6227	18.9962	18.2546	17.6537	(90)
Living area fraction										FLA = Living area / (4) =		0.2646	(91)
MIT	18.1392	18.3605	18.7394	19.2580	19.7309	20.0399	20.1310	20.1198	19.9185	19.3347	18.6537	18.1034	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.9892	18.2105	18.5894	19.1080	19.5809	19.8899	19.9810	19.9698	19.7685	19.1847	18.5037	17.9534	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9894	0.9826	0.9681	0.9309	0.8451	0.6811	0.4947	0.5488	0.7983	0.9436	0.9820	0.9913	(94)
Ext temp.	319.8377	390.8039	421.3367	440.9229	423.9419	335.6866	231.9417	240.7137	324.9391	349.8847	337.3257	332.9993	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	996.9377	967.2216	876.5842	732.6122	564.5070	375.5065	240.0021	252.9746	403.7910	614.9193	820.0417	993.0320	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	481.4424	387.3527	338.7041	210.0163	104.5782	0.0000	0.0000	0.0000	0.0000	197.1857	347.5556	491.0643	(98)
Space heating per m2												2557.8993	(98)
												46.2884	(99)

8c. Space cooling requirement

Not applicable

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

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	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													2826.4081 (211)
Space heating requirement	481.4424	387.3527	338.7041	210.0163	104.5782	0.0000	0.0000	0.0000	0.0000	197.1857	347.5556	491.0643	(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)	531.9806	428.0140	374.2587	232.0622	115.5560	0.0000	0.0000	0.0000	0.0000	217.8848	384.0393	542.6125	(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	141.2872	123.9560	128.8377	113.6358	110.0117	96.3675	90.7189	102.0786	102.6964	117.9323	127.0372	137.2632	(64)
Efficiency of water heater (217)m	89.7536	89.7029	89.5950	89.3501	88.8307	87.3000	87.3000	87.3000	87.3000	89.2753	89.6207	89.7811	(217)
Fuel for water heating, kWh/month	157.4168	138.1851	143.8001	127.1804	123.8442	110.3866	103.9163	116.9285	117.6361	132.0995	141.7499	152.8865	(219)
Water heating fuel used													1566.0301 (219)
Annual totals kWh/year													
Space heating fuel - main system													2826.4081 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating plus fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													265.5617 (232)
Total delivered energy for all uses													4732.9999 (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	2826.4081	0.2160	610.5041	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1566.0301	0.2160	338.2625	(264)
Space and water heating			948.7667	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	265.5617	0.5190	137.8265	(268)
Total CO2, kg/year			1125.5182	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.3700	(273)

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

DER			20.3700	ZC1
Total Floor Area		TFA	55.2600	
Assumed number of occupants		N	1.8450	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.2493	ZC2
CO2 emissions from cooking, equation (L16)			2.9547	ZC3
Total CO2 emissions			40.5740	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			40.5740	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 132.6240 (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				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour 20.0000 / (5) =	0.1508 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4008 (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) =	0.3407 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4344	0.4259	0.4173	0.3748	0.3662	0.3236	0.3236	0.3151	0.3407	0.3662	0.3833	0.4003 (22b)
	0.5943	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5734	0.5801 (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	R-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			8.6200	1.3258	11.4280		(27)					
150mm TE Platinum			55.2600	0.1300	7.1838		(28a)					
50mm Alreflex	51.9100	10.7400	41.1700	0.1800	7.4106		(29a)					
400mm Mineral Wool	55.2600		55.2600	0.1300	7.1838		(30)					
Total net area of external elements Aum, m ²			162.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.3262	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5137 (36)					
Total fabric heat loss							(33) + (36) = 43.8399 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.0118	Feb 25.8514	Mar 25.6943	Apr 24.9562	May 24.8180	Jun 24.1752	Jul 24.1752	Aug 24.0561	Sep 24.4228	Oct 24.8180	Nov 25.0974	Dec 25.3895 (38)
Heat Transfer coeff	69.8517	69.6914	69.5342	68.7961	68.6580	68.0151	68.0151	67.8960	68.2627	68.6580	68.9374	69.2294 (39)
Average = Sum(39)m / 12 =												68.7954 (39)
HLP	Jan 1.2641	Feb 1.2612	Mar 1.2583	Apr 1.2450	May 1.2425	Jun 1.2308	Jul 1.2308	Aug 1.2287	Sep 1.2353	Oct 1.2425	Nov 1.2475	Dec 1.2528 (40)
HLP (average)												1.2449 (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												1.8450 (42)
Average daily hot water use (litres/day)												78.0181 (43)
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy conte	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (45)
Energy content (annual)												Total = Sum(45)m = 1227.5289 (45)
Distribution loss (46)m = 0.15 x (45)m	19.0903	16.6965	17.2293	15.0209	14.4129	12.4372	11.5249	13.2250	13.3830	15.5966	17.0249	18.4879 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	43.7329	38.0643	40.5523	37.7052	37.3718	34.6272	35.7815	37.3718	37.7052	40.5523	40.7832	43.7329 (61)
Total heat required for water heating calculated for each month	171.0014	149.3741	155.4141	137.8445	133.4578	117.5422	112.6143	125.5386	126.9250	144.5294	154.2823	166.9856 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	171.0014	149.3741	155.4141	137.8445	133.4578	117.5422	112.6143	125.5386	126.9250	144.5294	154.2823	166.9856 (64)
Heat gains from water heating, kWh/month	53.2500	46.5266	48.3296	42.7226	41.2915	36.2260	34.4923	38.6584	39.0919	44.7105	47.9343	51.9148 (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	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0372	13.3559	10.8618	8.2230	6.1468	5.1894	5.6073	7.2886	9.7828	12.4215	14.4977	15.4551 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.8554	162.5246	158.3183	149.3637	138.0600	127.4362	120.3389	118.6697	122.8759	131.8306	143.1342	153.7581 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249 (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)	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989 (71)
Water heating gains (Table 5)	71.5726	69.2360	64.9592	59.3370	55.4994	50.3139	46.3606	51.9602	54.2943	60.0947	66.5754	69.7779 (72)
Total internal gains	301.1398	298.7911	287.8139	270.5983	253.3809	236.6142	225.9814	231.5931	240.6276	258.0214	277.8819	292.6657 (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	6.1400	10.6334	0.6300		0.7000	0.7700	19.9532 (74)
South	2.4800	46.7521	0.6300		0.7000	0.7700	35.4343 (78)

Solar gains	55.3875	96.1639	138.7177	187.6260	227.2645	233.8761	221.9923	190.6753	155.1255	107.9839	66.6166	47.2525 (83)
Total gains	356.5273	394.9550	426.5315	458.2243	480.6453	470.4903	447.9737	422.2685	395.7532	366.0053	344.4985	339.9182 (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	54.9378	55.0642	55.1887	55.7808	55.8930	56.4213	56.4213	56.5202	56.2166	55.8930	55.6665	55.4316	
alpha	4.6625	4.6709	4.6792	4.7187	4.7262	4.7614	4.7614	4.7680	4.7478	4.7262	4.7111	4.6954	
util living area	0.9972	0.9950	0.9896	0.9722	0.9196	0.7928	0.6320	0.6842	0.8894	0.9788	0.9948	0.9978 (86)	
MIT	19.6498	19.7856	20.0231	20.3536	20.6715	20.8957	20.9730	20.9608	20.8008	20.4053	19.9722	19.6255 (87)	
Th 2	19.8691	19.8714	19.8736	19.8842	19.8862	19.8954	19.8954	19.8971	19.8919	19.8862	19.8822	19.8780 (88)	
util rest of house	0.9963	0.9933	0.9857	0.9606	0.8832	0.7015	0.4909	0.5459	0.8256	0.9677	0.9927	0.9970 (89)	
MIT 2	18.0833	18.2829	18.6300	19.1122	19.5494	19.8215	19.8851	19.8801	19.7236	19.1925	18.5634	18.0540 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	18.4977	18.6805	18.9985	19.4406	19.8463	20.1057	20.1729	20.1660	20.0086	19.5134	18.9361	18.4698 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.4977	18.6805	18.9985	19.4406	19.8463	20.1057	20.1729	20.1660	20.0086	19.5134	18.9361	18.4698 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9946	0.9907	0.9815	0.9545	0.8816	0.7210	0.5286	0.5824	0.8338	0.9626	0.9900	0.9956 (94)
Useful gains	354.5848	391.2669	418.6219	437.3787	423.7247	339.2368	236.7837	245.9328	329.9662	352.3270	341.0476	338.4266 (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	991.7351	960.3805	869.0760	725.1541	559.3096	374.4715	243.0108	255.6989	403.3395	611.9745	815.9518	987.8905 (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	474.0398	382.4443	335.1379	207.1983	100.8751	0.0000	0.0000	0.0000	0.0000	193.1777	341.9310	483.2012 (98)
Space heating	2518.0055 (98)											
Space heating per m2	(98) / (4) = 45.5665 (99)											

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													2695.9373 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	474.0398	382.4443	335.1379	207.1983	100.8751	0.0000	0.0000	0.0000	0.0000	193.1777	341.9310	483.2012	(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)	507.5373	409.4693	358.8200	221.8398	108.0034	0.0000	0.0000	0.0000	0.0000	206.8284	366.0932	517.3460	(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	171.0014	149.3741	155.4141	137.8445	133.4578	117.5422	112.6143	125.5386	126.9250	144.5294	154.2823	166.9856	(64)
Efficiency of water heater	87.4830	87.3153	86.9357	86.0749	84.3572	80.3000	80.3000	80.3000	80.3000	85.7824	86.9978	87.5712	(216)
Fuel for water heating, kWh/month	195.4682	171.0743	178.7689	160.1448	158.2056	146.3788	140.2420	156.3370	158.0636	168.4839	177.3405	190.6856	(219)
Water heating fuel used													2001.1932 (219)
Annual totals kWh/year													
Space heating fuel - main system													2695.9373 (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)													265.5617 (232)
Total delivered energy for all uses													5037.6923 (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	2695.9373	0.2160	582.3225 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2001.1932	0.2160	432.2577 (264)
Space and water heating			1014.5802 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	265.5617	0.5190	137.8265 (268)
Total CO2, kg/m2/year			1191.3317 (272)
Emissions per m2 for space and water heating			18.3601 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4941 (272b)
Emissions per m2 for pumps and fans			0.7044 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.3601 * 1.00) + 2.4941 + 0.7044, rounded to 2 d.p.			21.5600 (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	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 132.6240 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1508 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.4013	(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) =	0.3411 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4349	0.4264	0.4179	0.3752	0.3667	0.3241	0.3241	0.3155	0.3411	0.3667	0.3837	0.4008 (22b)
Effective ac	0.5946	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803 (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	R-value kJ/m ² K	A x K kJ/K					
Opening Type 1			2.1200	1.0000	2.1200		(26)					
Opening Type 2 (Uw = 1.41)			8.6200	1.3347	11.5053		(27)					
150mm TE Platinum			55.2600	0.1500	8.2890		(28a)					
50mm Alreflex	51.9100	10.7400	41.1700	0.2700	11.1159		(29a)					
400mm Mineral Wool	55.2600		55.2600	0.1100	6.0786		(30)					
Total net area of external elements Aum(A, m ²)			162.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.1088	(33)					
Party wall			19.8700	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							211.5000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6957 (36)					
Total fabric heat loss						(33) + (36) =	46.8045 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.0221	25.8613	25.7038	24.9638	24.8254	24.1809	24.1809	24.0615	24.4291	24.8254	25.1055	25.3983 (38)
Heat transfer coeff	72.8266	72.6659	72.5083	71.7683	71.6299	70.9854	70.9854	70.8660	71.2336	71.6299	71.9100	72.2028 (39)
Average = Sum(39)m / 12 =												71.7677 (39)
HLP	1.3179	1.3150	1.3121	1.2987	1.2962	1.2846	1.2846	1.2824	1.2891	1.2962	1.3013	1.3066 (40)
HLP (average)												1.2987 (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												1.8450 (42)
Average daily hot water use (litres/day)												78.0181 (43)
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy content (annual)	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (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												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)
	27.0446	23.6533	24.4081	21.2796	20.4183	17.6194	16.3270	18.7355	18.9592	22.0951	24.1186	26.1912	(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	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0372	13.3559	10.8618	8.2230	6.1468	5.1894	5.6073	7.2886	9.7828	12.4215	14.4977	15.4551	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.8554	162.5246	158.3183	149.3637	138.0600	127.4362	120.3389	118.6697	122.8759	131.8306	143.1342	153.7581	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	(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)	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	(71)
Water heating gains (Table 5)	36.3502	35.1984	32.8066	29.5550	27.4439	24.4714	21.9449	25.1821	26.3322	29.6978	33.4980	35.2032	(72)
Total internal gains	262.9174	261.7535	252.6613	237.8163	222.3254	207.7717	198.5657	201.8150	209.6656	224.6245	241.8046	255.0910	(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	6.1400	10.6334	0.7100	0.7100	0.7000	0.7700	22.4869	(74)					
South	2.4800	46.7521	0.7100	0.7100	0.7000	0.7700	39.9339	(78)					
Solar gains	62.4208	108.3751	156.3326	211.4515	256.1234	263.5747	250.1818	214.8880	174.8240	121.6962	75.0758	53.2528	(83)
Total gains	325.3383	370.1287	408.9939	449.2678	478.4488	471.3463	448.7475	416.7030	384.4896	346.3206	316.8804	308.3438	(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)	44.5788	44.6774	44.7745	45.2362	45.3236	45.7351	45.7351	45.8121	45.5757	45.3236	45.1471	44.9640	21.0000 (85)
tau	3.9719	3.9785	3.9850	4.0157	4.0216	4.0490	4.0490	4.0541	4.0384	4.0216	4.0098	3.9976	
util living area	0.9961	0.9930	0.9857	0.9645	0.9081	0.7869	0.6379	0.6938	0.8862	0.9749	0.9932	0.9969	(86)
MIT	19.3317	19.4986	19.7864	20.1832	20.5649	20.8430	20.9509	20.9305	20.7164	20.2350	19.7151	19.3026	(87)
Th 2	19.8268	19.8291	19.8313	19.8418	19.8438	19.8529	19.8529	19.8546	19.8494	19.8438	19.8398	19.8357	(88)
util rest of house	0.9949	0.9908	0.9810	0.9516	0.8715	0.6989	0.4970	0.5574	0.8260	0.9634	0.9907	0.9959	(89)
MIT 2	18.3176	18.4855	18.7728	19.1703	19.5313	19.7711	19.8381	19.8310	19.6764	19.2268	18.7100	18.2953	(90)
Living area fraction	18.5859	18.7535	19.0410	19.4383	19.8047	20.0547	20.1325	20.1219	19.9516	19.4935	18.9759	18.5618	(91)
MIT	18.5859	18.7535	19.0410	19.4383	19.8047	20.0547	20.1325	20.1219	19.9516	19.4935	18.9759	18.5618	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5859	18.7535	19.0410	19.4383	19.8047	20.0547	20.1325	20.1219	19.9516	19.4935	18.9759	18.5618	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9891	0.9768	0.9459	0.8700	0.7164	0.5341	0.5926	0.8325	0.9587	0.9881	0.9945	(94)
Useful gains	323.1224	365.7284	399.4960	424.9599	416.2428	337.6755	239.6872	246.9300	320.0876	332.0264	313.1127	306.6411	(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	1040.3937	1006.6780	909.3247	756.3137	580.5422	387.2024	250.7570	263.7567	416.8292	637.0439	853.9942	1036.9635	(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	533.6498	430.7181	379.3126	238.5747	122.2387	0.0000	0.0000	0.0000	0.0000	226.9330	389.4347	543.3598	(98)
Space heating												2864.2215	(98)
Space heating per m2										(98) / (4) =		51.8317	(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	667.2626	525.2919	538.5819	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7718	0.8472	0.8150	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	515.0017	445.0462	438.9704	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	620.5368	592.8081	556.5047	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	75.9853	109.9348	87.4455	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												273.3657	(104)
Cooled fraction												1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	18.9963	27.4837	21.8614	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling											68.3414	(107)
Space cooling per m2											1.2367	(108)
Energy for space heating											51.8317	(99)
Energy for space cooling											1.2367	(108)
Total											53.0685	(109)
Dwelling Fabric Energy Efficiency (DFEE)											53.1	(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	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 132.6240 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1508 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4008	(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) =	0.3407 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4344	0.4259	0.4173	0.3748	0.3662	0.3236	0.3236	0.3151	0.3407	0.3662	0.3833	0.4003 (22b)
	0.5943	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5734	0.5801 (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	R-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			8.6200	1.3258	11.4280		(27)					
150mm TE Platinum			55.2600	0.1300	7.1838		(28a)					
50mm Alreflex	51.9100	10.7400	41.1700	0.1800	7.4106		(29a)					
400mm Mineral Wool	55.2600		55.2600	0.1300	7.1838		(30)					
Total net area of external elements Aum, m ²			162.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.3262	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5137 (36)					
Total fabric heat loss							(33) + (36) = 43.8399 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.0118	Feb 25.8514	Mar 25.6943	Apr 24.9562	May 24.8180	Jun 24.1752	Jul 24.1752	Aug 24.0561	Sep 24.4228	Oct 24.8180	Nov 25.0974	Dec 25.3895 (38)
Heat Transfer coeff	69.8517	69.6914	69.5342	68.7961	68.6580	68.0151	68.0151	67.8960	68.2627	68.6580	68.9374	69.2294 (39)
Average = Sum(39)m / 12 =												68.7954 (39)
HLP	Jan 1.2641	Feb 1.2612	Mar 1.2583	Apr 1.2450	May 1.2425	Jun 1.2308	Jul 1.2308	Aug 1.2287	Sep 1.2353	Oct 1.2425	Nov 1.2475	Dec 1.2528 (40)
HLP (average)												1.2449 (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												1.8450 (42)
Average daily hot water use (litres/day)												78.0181 (43)
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy content	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (45)
Energy content (annual)												Total = Sum(45)m = 1227.5289 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	14.7124	22.9386	17.9950	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													55.6460 (107)
Energy for space heating													1.0070 (108)
Energy for space cooling													50.4740 (99)
Total													1.0070 (108)
Target Fabric Energy Efficiency (TFEE)													51.4810 (109)
													59.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Bedale Mid-Terrace			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 038, Chipping Lane , Longridge , PR3				
SAP Rating	83 B	DER	19.14	TER	20.69
Environmental	87 B	% DER<TER	7.48		
CO₂ Emissions (t/year)	0.94	DFEE	47.45	TFEE	54.61
General Requirements Compliance	Pass	% DFEE<TFEE	13.11		
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

Mid-Terrace Bungalow, total floor area 55 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) 20.69 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.14 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 47.5 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	1.33 (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

OK

Minimum: 88.0%

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: 6.14 m², No overhang
Windows facing South: 2.48 m², No overhang
Air change rate: 3.00 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	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 132.6240 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1508 (8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.4013	(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) =	0.3411 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4349	0.4264	0.4179	0.3752	0.3667	0.3241	0.3241	0.3155	0.3411	0.3667	0.3837	0.4008 (22b)
Effective ac	0.5946	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803 (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	R-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.41)			8.6200	1.3347	11.5053		(27)
150mm TE Platinum			55.2600	0.1400	7.7364		(28a)
50mm Alreflex	32.0400	10.7400	21.3000	0.2700	5.7510		(29a)
400mm Mineral Wool	55.2600		55.2600	0.1100	6.0786		(30)
Total net area of external elements Aum(A, m ²)			142.5600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.1913	(33)
Party wall			39.7300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 220.8400 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8582 (36)
 Total fabric heat loss (33) + (36) = 41.0495 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.0221	25.8613	25.7038	24.9638	24.8254	24.1809	24.1809	24.0615	24.4291	24.8254	25.1055	25.3983 (38)
Heat transfer coeff	67.0716	66.9108	66.7533	66.0133	65.8749	65.2304	65.2304	65.1110	65.4786	65.8749	66.1550	66.4478 (39)
Average = Sum(39)m / 12 =												66.0127 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2137	1.2108	1.2080	1.1946	1.1921	1.1804	1.1804	1.1783	1.1849	1.1921	1.1972	1.2025 (40)
HLP (average)												1.1946 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8450 (42)
 Average daily hot water use (litres/day) 78.0181 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy conte	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (45)
Energy content (annual)												Total = Sum(45)m = 1227.5289 (45)
Distribution loss (46)m = 0.15 x (45)m												
19.0903	16.6965	17.2293	15.0209	14.4129	12.4372	11.5249	13.2250	13.3830	15.5966	17.0249	18.4879 (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

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												2510.9154 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	437.2469	348.2340	299.1471	177.9970	81.6472	0.0000	0.0000	0.0000	0.0000	169.6049	311.8481	446.6533 (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)	483.1457	384.7889	330.5493	196.6818	90.2179	0.0000	0.0000	0.0000	0.0000	187.4087	344.5836	493.5396 (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	141.2872	123.9560	128.8377	113.6358	110.0117	96.3675	90.7189	102.0786	102.6964	117.9323	127.0372	137.2632 (64)
Efficiency of water heater (217)m	89.6971	89.6375	89.5123	89.2256	88.6351	87.3000	87.3000	87.3000	87.3000	89.1596	89.5499	89.7269 (217)
Fuel for water heating, kWh/month	157.5160	138.2860	143.9330	127.3579	124.1175	110.3866	103.9163	116.9285	117.6361	132.2710	141.8620	152.9789 (219)
Water heating fuel used												1567.1897 (219)
Annual totals kWh/year												
Space heating fuel - main system												2510.9154 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating plus fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												265.5617 (232)
Total delivered energy for all uses												4418.6668 (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	2510.9154	0.2160	542.3577 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1567.1897	0.2160	338.5130 (264)
Space and water heating			880.8707 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	265.5617	0.5190	137.8265 (268)
Total CO2, kg/year			1057.6222 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.1400 (273)

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

DER			19.1400 ZC1
Total Floor Area	TFA	55.2600	
Assumed number of occupants	N	1.8450	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.2493	ZC2
CO2 emissions from cooking, equation (L16)		2.9547	ZC3
Total CO2 emissions		39.3440	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		39.3440	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	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 132.6240 (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				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour 20.0000 / (5) =	0.1508 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4008 (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) =		0.3407 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4344	0.4259	0.4173	0.3748	0.3662	0.3236	0.3236	0.3151	0.3407	0.3662	0.3833	0.4003 (22b)
	0.5943	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5734	0.5801 (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	R-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			8.6200	1.3258	11.4280		(27)					
150mm TE Platinum			55.2600	0.1300	7.1838		(28a)					
50mm Alreflex	32.0400	10.7400	21.3000	0.1800	3.8340		(29a)					
400mm Mineral Wool	55.2600		55.2600	0.1300	7.1838		(30)					
Total net area of external elements Aum, m ²			142.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)... (30) + (32) =		31.7496 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2055 (36)					
Total fabric heat loss						(33) + (36) =	39.9551 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.0118	Feb 25.8514	Mar 25.6943	Apr 24.9562	May 24.8180	Jun 24.1752	Jul 24.1752	Aug 24.0561	Sep 24.4228	Oct 24.8180	Nov 25.0974	Dec 25.3895 (38)
Heat transfer coeff	65.9669	65.8066	65.6494	64.9113	64.7732	64.1303	64.1303	64.0112	64.3779	64.7732	65.0526	65.3446 (39)
Average = Sum(39)m / 12 =												64.9106 (39)
HLP	Jan 1.1938	Feb 1.1909	Mar 1.1880	Apr 1.1747	May 1.1722	Jun 1.1605	Jul 1.1605	Aug 1.1584	Sep 1.1650	Oct 1.1722	Nov 1.1772	Dec 1.1825 (40)
HLP (average)												1.1746 (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												1.8450 (42)
Average daily hot water use (litres/day)												78.0181 (43)
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy content	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (45)
Energy content (annual)												Total = Sum(45)m = 1227.5289 (45)
Distribution loss (46)m = 0.15 x (45)m	19.0903	16.6965	17.2293	15.0209	14.4129	12.4372	11.5249	13.2250	13.3830	15.5966	17.0249	18.4879 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	43.7329	38.0643	40.5523	37.7052	37.3718	34.6272	35.7815	37.3718	37.7052	40.5523	40.7832	43.7329 (61)
Total heat required for water heating calculated for each month	171.0014	149.3741	155.4141	137.8445	133.4578	117.5422	112.6143	125.5386	126.9250	144.5294	154.2823	166.9856 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	171.0014	149.3741	155.4141	137.8445	133.4578	117.5422	112.6143	125.5386	126.9250	144.5294	154.2823	166.9856 (64)
Heat gains from water heating, kWh/month	53.2500	46.5266	48.3296	42.7226	41.2915	36.2260	34.4923	38.6584	39.0919	44.7105	47.9343	51.9148 (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	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0372	13.3559	10.8618	8.2230	6.1468	5.1894	5.6073	7.2886	9.7828	12.4215	14.4977	15.4551 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.8554	162.5246	158.3183	149.3637	138.0600	127.4362	120.3389	118.6697	122.8759	131.8306	143.1342	153.7581 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249 (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)	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989 (71)
Water heating gains (Table 5)	71.5726	69.2360	64.9592	59.3370	55.4994	50.3139	46.3606	51.9602	54.2943	60.0947	66.5754	69.7779 (72)
Total internal gains	301.1398	298.7911	287.8139	270.5983	253.3809	236.6142	225.9814	231.5931	240.6276	258.0214	277.8819	292.6657 (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	6.1400	10.6334	0.6300	0.7000	0.7700	19.9532 (74)						
South	2.4800	46.7521	0.6300	0.7000	0.7700	35.4343 (78)						
Solar gains	55.3875	96.1639	138.7177	187.6260	227.2645	233.8761	221.9923	190.6753	155.1255	107.9839	66.6166	47.2525 (83)
Total gains	356.5273	394.9550	426.5315	458.2243	480.6453	470.4903	447.9737	422.2685	395.7532	366.0053	344.4985	339.9182 (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	58.1731	58.3148	58.4544	59.1192	59.2452	59.8391	59.8391	59.9504	59.6089	59.2452	58.9908	58.7271
alpha	4.8782	4.8877	4.8970	4.9413	4.9497	4.9893	4.9893	4.9967	4.9739	4.9497	4.9327	4.9151
util living area	0.9972	0.9949	0.9891	0.9697	0.9105	0.7715	0.6051	0.6579	0.8768	0.9771	0.9947	0.9978 (86)
MIT	19.7420	19.8756	20.1054	20.4229	20.7211	20.9195	20.9812	20.9718	20.8352	20.4651	20.0503	19.7183 (87)
Th 2	19.9250	19.9273	19.9296	19.9403	19.9423	19.9517	19.9517	19.9535	19.9481	19.9423	19.9383	19.9340 (88)
util rest of house	0.9963	0.9932	0.9850	0.9575	0.8724	0.6813	0.4733	0.5271	0.8112	0.9655	0.9925	0.9971 (89)
MIT 2	18.2568	18.4532	18.7888	19.2516	19.6583	19.8954	19.9445	19.9413	19.8104	19.3182	18.7165	18.2285 (90)
Living area fraction	fLA = Living area / (4) = 0.2646 (91)											
MIT	18.6497	18.8295	19.1371	19.5615	19.9395	20.1663	20.2188	20.2139	20.0815	19.6216	19.0694	18.6227 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6497	18.8295	19.1371	19.5615	19.9395	20.1663	20.2188	20.2139	20.0815	19.6216	19.0694	18.6227 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9947	0.9906	0.9809	0.9518	0.8723	0.7016	0.5085	0.5618	0.8210	0.9607	0.9899	0.9957 (94)
Useful gains	354.6241	391.2599	418.3979	436.1312	419.2702	330.1128	227.7865	237.2110	324.9218	351.6191	341.0310	338.4684 (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	946.6065	916.6520	829.6174	692.0527	533.7001	356.9710	232.0729	244.1347	385.0794	584.3572	778.6412	942.4454 (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	440.4349	353.0635	305.9473	184.2634	85.1358	0.0000	0.0000	0.0000	0.0000	173.1571	315.0793	449.3589 (98)
Space heating per m2	(98) / (4) = 41.7380 (99)											

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													2469.4222 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	440.4349	353.0635	305.9473	184.2634	85.1358	0.0000	0.0000	0.0000	0.0000	173.1571	315.0793	449.3589	(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)	471.5577	378.0123	327.5667	197.2842	91.1518	0.0000	0.0000	0.0000	0.0000	185.3930	337.3440	481.1123	(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	171.0014	149.3741	155.4141	137.8445	133.4578	117.5422	112.6143	125.5386	126.9250	144.5294	154.2823	166.9856	(64)
Efficiency of water heater	87.3281	87.1415	86.7255	85.7826	83.9531	80.3000	80.3000	80.3000	80.3000	85.5071	86.8109	87.4210	(216)
Fuel for water heating, kWh/month	195.8149	171.4157	179.2024	160.6904	158.9670	146.3788	140.2420	156.3370	158.0636	169.0262	177.7223	191.0133	(219)
Water heating fuel used													2004.8735 (219)
Annual totals kWh/year													
Space heating fuel - main system													2469.4222 (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)													265.5617 (232)
Total delivered energy for all uses													4814.8574 (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	2469.4222	0.2160	533.3952 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2004.8735	0.2160	433.0527 (264)
Space and water heating			966.4479 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	265.5617	0.5190	137.8265 (268)
Total CO2, kg/m2/year			1143.1994 (272)
Emissions per m2 for space and water heating			17.4891 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4941 (272b)
Emissions per m2 for pumps and fans			0.7044 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.4891 * 1.00) + 2.4941 + 0.7044, rounded to 2 d.p.			20.6900 (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	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 132.6240 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1508 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4013 (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) =	0.3411 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4349	0.4264	0.4179	0.3752	0.3667	0.3241	0.3241	0.3155	0.3411	0.3667	0.3837	0.4008 (22b)
Effective ac	0.5946	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803 (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	R-value kJ/m ² K	A x K kJ/K					
Opening Type 1			2.1200	1.0000	2.1200		(26)					
Opening Type 2 (Uw = 1.41)			8.6200	1.3347	11.5053		(27)					
150mm TE Platinum			55.2600	0.1400	7.7364		(28a)					
50mm Alreflex	32.0400	10.7400	21.3000	0.2700	5.7510		(29a)					
400mm Mineral Wool	55.2600		55.2600	0.1100	6.0786		(30)					
Total net area of external elements Aum(A, m ²)			142.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)... (30) + (32) =	33.1913	(33)					
Party wall			39.7300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							220.8400 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8582 (36)					
Total fabric heat loss						(33) + (36) =	41.0495 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.0221	25.8613	25.7038	24.9638	24.8254	24.1809	24.1809	24.0615	24.4291	24.8254	25.1055	25.3983 (38)
Heat transfer coeff	67.0716	66.9108	66.7533	66.0133	65.8749	65.2304	65.2304	65.1110	65.4786	65.8749	66.1550	66.4478 (39)
Average = Sum(39)m / 12 =												66.0127 (39)
HLP	1.2137	1.2108	1.2080	1.1946	1.1921	1.1804	1.1804	1.1783	1.1849	1.1921	1.1972	1.2025 (40)
HLP (average)												1.1946 (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												1.8450 (42)
Average daily hot water use (litres/day)												78.0181 (43)
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy content (annual)	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1227.5289 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	20.9893	30.3565	24.1958	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											75.5415 (107)
Space cooling per m2											1.3670 (108)
Energy for space heating											46.0831 (99)
Energy for space cooling											1.3670 (108)
Total											47.4501 (109)
Dwelling Fabric Energy Efficiency (DFEE)											47.5 (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	55.2600 (1b)	x 2.4000 (2b)	= 132.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	55.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 132.6240 (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				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour 20.0000 / (5) =	0.1508 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4008	(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) =	0.3407 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22a)
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	0.4344	0.4259	0.4173	0.3748	0.3662	0.3236	0.3236	0.3151	0.3407	0.3662	0.3833	0.4003 (22b)
	0.5943	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5734	0.5801 (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	R-value kJ/m ² K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			8.6200	1.3258	11.4280		(27)					
150mm TE Platinum			55.2600	0.1300	7.1838		(28a)					
50mm Alreflex	32.0400	10.7400	21.3000	0.1800	3.8340		(29a)					
400mm Mineral Wool	55.2600		55.2600	0.1300	7.1838		(30)					
Total net area of external elements Aum, m ²			142.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		31.7496 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2055 (36)					
Total fabric heat loss							(33) + (36) = 39.9551 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.0118	25.8514	25.6943	24.9562	24.8180	24.1752	24.1752	24.0561	24.4228	24.8180	25.0974	25.3895 (38)
Heat transfer coeff	65.9669	65.8066	65.6494	64.9113	64.7732	64.1303	64.1303	64.0112	64.3779	64.7732	65.0526	65.3446 (39)
Average = Sum(39)m / 12 =												64.9106 (39)
HLP	1.1938	1.1909	1.1880	1.1747	1.1722	1.1605	1.1605	1.1584	1.1650	1.1722	1.1772	1.1825 (40)
HLP (average)												1.1746 (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												1.8450 (42)
Average daily hot water use (litres/day)												78.0181 (43)
Daily hot water use	85.8199	82.6992	79.5785	76.4578	73.3370	70.2163	70.2163	73.3370	76.4578	79.5785	82.6992	85.8199 (44)
Energy conte	127.2685	111.3098	114.8618	100.1393	96.0860	82.9149	76.8329	88.1668	89.2198	103.9771	113.4992	123.2527 (45)
Energy content (annual)												Total = Sum(45)m = 1227.5289 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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 (59)
Heat gains from water heating, kWh/month	27.0446	23.6533	24.4081	21.2796	20.4183	17.6194	16.3270	18.7355	18.9592	22.0951	24.1186	26.1912	(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	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	92.2487	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0372	13.3559	10.8618	8.2230	6.1468	5.1894	5.6073	7.2886	9.7828	12.4215	14.4977	15.4551	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.8554	162.5246	158.3183	149.3637	138.0600	127.4362	120.3389	118.6697	122.8759	131.8306	143.1342	153.7581	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	32.2249	(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)	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	-73.7989	(71)
Water heating gains (Table 5)	36.3502	35.1984	32.8066	29.5550	27.4439	24.4714	21.9449	25.1821	26.3322	29.6978	33.4980	35.2032	(72)
Total internal gains	262.9174	261.7535	252.6613	237.8163	222.3254	207.7717	198.5657	201.8150	209.6656	224.6245	241.8046	255.0910	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W	(74)					
North	6.1400	10.6334	0.6300	0.7000	0.7700	19.9532	(74)						
South	2.4800	46.7521	0.6300	0.7000	0.7700	35.4343	(78)						
Solar gains	55.3875	96.1639	138.7177	187.6260	227.2645	233.8761	221.9923	190.6753	155.1255	107.9839	66.6166	47.2525	(83)
Total gains	318.3050	357.9174	391.3790	425.4423	449.5899	441.6478	420.5580	392.4903	364.7911	332.6084	308.4212	302.3435	(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	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	58.1731	58.3148	58.4544	59.1192	59.2452	59.8391	59.8391	59.9504	59.6089	59.2452	58.9908	58.7271	
alpha	4.8782	4.8877	4.8970	4.9413	4.9497	4.9893	4.9893	4.9967	4.9739	4.9497	4.9327	4.9151	
util living area	0.9983	0.9967	0.9924	0.9772	0.9277	0.8011	0.6378	0.6960	0.9030	0.9844	0.9967	0.9987	(86)
MIT	19.6783	19.8145	20.0489	20.3746	20.6863	20.9039	20.9763	20.9639	20.8054	20.4139	19.9907	19.6554	(87)
Th 2	19.9250	19.9273	19.9296	19.9403	19.9423	19.9517	19.9517	19.9535	19.9481	19.9423	19.9383	19.9340	(88)
util rest of house	0.9978	0.9955	0.9895	0.9676	0.8947	0.7139	0.5022	0.5629	0.8455	0.9760	0.9954	0.9983	(89)
MIT 2	18.7226	18.8602	19.0952	19.4244	19.7195	19.9044	19.9453	19.9424	19.8327	19.4675	19.0451	18.7069	(90)
Living area fraction	18.9754	19.1127	19.3475	19.6757	19.9753	20.1688	20.2181	20.2126	20.0901	19.7179	19.2952	18.9578	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9754	19.1127	19.3475	19.6757	19.9753	20.1688	20.2181	20.2126	20.0901	19.7179	19.2952	18.9578	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	317.3635	355.8903	386.4410	410.3706	402.7870	324.2276	226.5224	234.9212	311.8427	323.8495	306.6305	301.6490	(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	968.0929	935.2866	843.4299	699.4674	536.0168	357.1311	232.0300	244.0524	385.6280	590.5974	793.3315	964.3463	(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	484.1427	389.3543	339.9998	208.1497	99.1230	0.0000	0.0000	0.0000	0.0000	198.4612	350.4247	493.0468	(98)
Space heating												2562.7021	(98)
Space heating pcr m2										(98) / (4) =		16.3754	(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	(100)
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	602.8247	474.5641	486.4854	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8209	0.8937	0.8656	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	494.8572	424.1272	421.0800	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	585.8242	559.8593	528.2041	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	65.4963	100.9847	79.7003	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												246.1813	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	16.3741	25.2462	19.9251	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													61.5453 (107)
Energy for space heating													1.1137 (108)
Energy for space cooling													46.3754 (99)
Total													1.1137 (108)
Target Fabric Energy Efficiency (TFEE)													47.4891 (109)
													54.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	Belmont End-Terrace			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	10 FOXGLOVE ROAD, LONGRIDGE, PRESTON, PR3 2RP				
SAP Rating	83 B	DER	18.45	TER	19.35
Environmental	87 B	% DER<TER	4.63		
CO₂ Emissions (t/year)	1.11	DFEE	47.75	TFEE	52.41
General Requirements Compliance	Pass	% DFEE<TFEE	8.89		
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 Built)

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

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

DWELLING AS BUILT

End-Terrace House, total floor area 67 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) 19.35 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.45 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 47.7 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	1.35 (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: 3.99 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 35

Combi boiler

Efficiency: 89.6% SEDBUK2009

OK

Minimum: 88.0%

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: 3.30 m², No overhang

Windows facing North West: 7.24 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

Party wall U-value 0.00 W/m²K

Roof U-value 0.11 W/m²K

Door U-value 1.00 W/m²K

Air permeability 4.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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) =	0.1814 (8)							
Pressure test					Yes							
Measured/design AP50					3.9900							
Infiltration rate					0.3809 (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) =		0.3238 (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	0.4128	0.4047	0.3966	0.3562	0.3481	0.3076	0.3076	0.2995	0.3238	0.3481	0.3643	0.3804 (22b)
Effective ac	0.5852	0.5819	0.5787	0.5634	0.5606	0.5473	0.5473	0.5448	0.5524	0.5606	0.5663	0.5724 (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			1.9300	1.0000	1.9300		(26)					
Opening Type 2 (Uw = 1.41)			10.5400	1.3347	14.0680		(27)					
150mm Platinum			33.3400	0.1500	5.0010		(28a)					
50 mm A. Platinum	81.0500	12.4700	68.5800	0.2700	18.5166		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1100	3.6674		(30)					
Total net area of external elements Aum(A, m ²)			147.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 43.1830		(33)					
E-WM-22			39.6800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							171.2000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4902 (36)					
Total fabric heat loss						(33) + (36) =	50.6732 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.9354	Feb 31.7548	Mar 31.5778	Apr 30.7465	May 30.5910	Jun 29.8670	Jul 29.8670	Aug 29.7329	Sep 30.1459	Oct 30.5910	Nov 30.9056	Dec 31.2346 (38)
Heat transfer coeff	82.6086	82.4280	82.2510	81.4197	81.2642	80.5401	80.5401	80.4060	80.8190	81.2642	81.5788	81.9078 (39)
Average = Sum(39)m / 12 =												81.4190 (39)
HLP	Jan 1.2389	Feb 1.2362	Mar 1.2335	Apr 1.2211	May 1.2187	Jun 1.2079	Jul 1.2079	Aug 1.2058	Sep 1.2120	Oct 1.2187	Nov 1.2234	Dec 1.2284 (40)
HLP (average)												1.2210 (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												2.1629 (42)
Average daily hot water use (litres/day)												85.5690 (43)
Daily hot water use	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy conte	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Energy content (annual)												Total = Sum(45)m = 1346.3342 (45)
Distribution loss (46)m = 0.15 x (45)m	20.9379	18.3124	18.8968	16.4747	15.8078	13.6410	12.6404	14.5050	14.6782	17.1061	18.6726	20.2772 (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 Built)

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	14.0719	12.6910	14.0205	13.5338	13.9600	13.4809	13.9123	13.9432	13.5097	13.9954	13.5838	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	(61)	
Total heat required for water heating calculated for each month	153.6579	134.7739	139.9990	123.3650	119.3456	104.4207	98.1814	110.6432	111.3646	128.0359	138.0679	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	(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	153.6579	134.7739	139.9990	123.3650	119.3456	104.4207	98.1814	110.6432	111.3646	128.0359	138.0679	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	(64)
Heat gains from water heating, kWh/month	49.9303	43.7653	45.3930	39.9023	38.5307	33.6077	31.4975	35.6386	35.9142	41.4173	44.7869	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	(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	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6611	15.6864	12.7571	9.6579	7.2194	6.0949	6.5858	8.5604	11.4898	14.5890	17.0275	18.1519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.4278	191.3935	186.4401	175.8948	162.5834	150.0725	141.7144	139.7487	144.7021	155.2474	168.5589	181.0698	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	(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)	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	(71)
Water heating gains (Table 5)	67.1107	65.1269	61.0121	55.4199	51.7886	46.6774	42.3354	47.9013	49.8808	55.6684	62.2040	65.1390	(72)
Total internal gains	332.6432	330.6505	318.6528	299.4163	280.0350	261.2883	249.0792	254.6541	264.5164	283.9484	306.2340	322.8043	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Southeast	3.3000	36.7938	0.7100	0.7000	0.7700	41.8195	(77)						
Northwest	7.2400	11.2829	0.7100	0.7000	0.7700	28.1352	(81)						
Solar gains	69.9547	128.5041	200.6480	290.2198	363.0474	377.1269	356.6388	299.7522	231.2640	148.7174	85.4915	58.7654	(83)
Total gains	402.5979	459.1546	519.3008	589.6360	643.0824	638.4153	605.7180	554.4063	495.7804	432.6657	391.7255	381.5697	(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	
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9911	0.9850	0.9703	0.9300	0.8410	0.6934	0.5471	0.6068	0.8269	0.9541	0.9855	0.9927	(86)
MIT	19.1994	19.3925	19.7336	20.1945	20.6034	20.8654	20.9575	20.9380	20.7270	20.2023	19.6216	19.1641	(87)
Th 2	19.8890	19.8912	19.8933	19.9032	19.9051	19.9137	19.9137	19.9153	19.9104	19.9051	19.9013	19.8974	(88)
util rest of house	0.9890	0.9814	0.9627	0.9111	0.7966	0.6088	0.4277	0.4872	0.7616	0.9380	0.9813	0.9909	(89)
MIT 2	17.4964	17.7783	18.2730	18.9344	19.4875	19.8073	19.8925	19.8812	19.6614	18.9583	18.1199	17.4501	(90)
Living area fraction	17.8539	18.1172	18.5797	19.1990	19.7218	20.0294	20.1161	20.1031	19.8851	19.2195	18.4352	17.8100	(92)
Temperature adjustment	17.7039	17.9672	18.4297	19.0490	19.5718	19.8794	19.9661	19.9531	19.7351	19.0695	18.2852	17.6600	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	395.5325	446.2835	492.6340	525.9620	501.9934	386.7958	262.7777	272.5982	371.3098	398.4285	380.7723	375.9415	(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	1107.2794	1077.1036	981.2300	826.3255	639.6981	425.2069	271.1061	285.6926	455.4237	688.2633	912.4766	1102.4784	(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	529.5397	423.9111	363.5154	216.2617	102.4523	0.0000	0.0000	0.0000	0.0000	215.6371	382.8271	540.5435	(98)
Space heating												2774.6879	(98)
Space heating per m ²												41.6120	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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													3065.9535 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.5397	423.9111	363.5154	216.2617	102.4523	0.0000	0.0000	0.0000	0.0000	215.6371	382.8271	540.5435	(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)	585.1268	468.4101	401.6745	238.9632	113.2070	0.0000	0.0000	0.0000	0.0000	238.2731	423.0134	597.2856	(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	153.6579	134.7739	139.9990	123.3650	119.3456	104.4207	98.1814	110.6432	111.3646	128.0359	138.0679	149.2436	(64)
Efficiency of water heater (217)m	89.7600	89.7068	89.5870	89.3109	88.7495	87.3000	87.3000	87.3000	87.3000	89.2808	89.6292	87.3000	(216)
Fuel for water heating, kWh/month	171.1875	150.2383	156.2717	138.1299	134.4746	119.6113	112.4644	126.7391	127.5655	143.4081	154.0434	166.2179	(219)
Water heating fuel used													1700.3516 (219)
Annual totals kWh/year													
Space heating fuel - main system													3065.9535 (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)													311.9004 (232)
Total delivered energy for all uses													5153.2055 (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	3065.9535	0.2160	662.2460 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1700.3516	0.2160	367.2759 (264)
Space and water heating			1029.5219 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	311.9004	0.5190	161.8763 (268)
Total CO2, kg/year			1230.3232 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4500 (273)

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

	TFA	N	EF	
DER				18.4500 ZC1
Total Floor Area				66.6800
Assumed number of occupants				2.1629
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190
CO2 emissions from appliances, equation (L14)				16.8343 ZC2
CO2 emissions from cooking, equation (L16)				2.5631 ZC3
Total CO2 emissions				37.8474 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				37.8474 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1209 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.3709 (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) =		0.3153 (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	0.4020	0.3941	0.3862	0.3468	0.3389	0.2995	0.2995	0.2917	0.3153	0.3389	0.3547	0.3705 (22b)
Effective ac	0.5808	0.5777	0.5746	0.5601	0.5574	0.5449	0.5449	0.5425	0.5497	0.5574	0.5629	0.5686 (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			1.9300	1.0000	1.9300		(26)					
TER Opening Type (Uw = 1.40)			10.5400	1.3258	13.9735		(27)					
150mm Platinum			33.3400	0.1300	4.3342		(28a)					
50 mm A. Platinum	81.0500	12.4700	68.5800	0.1800	12.3444		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1300	4.3342		(30)					
Total net area of external elements Aum(A, m ²)			147.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.9163		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2068 (36)					
Total fabric heat loss						(33) + (36) =	45.1231 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.6951	Feb 31.5239	Mar 31.3560	Apr 30.5677	May 30.4202	Jun 29.7336	Jul 29.7336	Aug 29.6064	Sep 29.9980	Oct 30.4202	Nov 30.7186	Dec 31.0305 (38)
Heat transfer coeff	76.8182	76.6470	76.4791	75.6908	75.5433	74.8567	74.8567	74.7295	75.1211	75.5433	75.8417	76.1536 (39)
Average = Sum(39)m / 12 =												75.6901 (39)
HLP	Jan 1.1520	Feb 1.1495	Mar 1.1470	Apr 1.1351	May 1.1329	Jun 1.1226	Jul 1.1226	Aug 1.1207	Sep 1.1266	Oct 1.1329	Nov 1.1374	Dec 1.1421 (40)
HLP (average)												1.1351 (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												2.1629 (42)
Average daily hot water use (litres/day)												85.5690 (43)
Daily hot water use	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy conte	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Energy content (annual)												Total = Sum(45)m = 1346.3342 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	20.9379	18.3124	18.8968	16.4747	15.8078	13.6410	12.6404	14.5050	14.6782	17.1061	18.6726	20.2772 (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 Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	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													2844.5715 (211)
Space heating requirement	517.4494	412.5575	348.9641	197.2249	80.4813	0.0000	0.0000	0.0000	0.0000	200.3115	371.0945	528.7467	(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)	554.0143	441.7104	373.6233	211.1616	86.1684	0.0000	0.0000	0.0000	0.0000	214.4662	397.3174	566.1100	(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	187.5516	163.8312	170.4557	151.1856	146.3744	128.9184	123.5136	137.6887	139.2094	158.5176	169.2144	183.1472	(64)
Efficiency of water heater (217)m	87.4731	87.2797	86.8165	85.7214	83.6142	80.3000	80.3000	80.3000	80.3000	85.6414	86.9740	87.5665	(216)
Fuel for water heating, kWh/month	214.4107	187.7083	196.3401	176.3686	175.0592	160.5459	153.8152	171.4679	173.3616	185.0946	194.5575	209.1522	(219)
Water heating fuel used													2197.8817 (219)
Annual totals kWh/year													
Space heating fuel - main system													2844.5715 (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)													311.9004 (232)
Total delivered energy for all uses													5429.3537 (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	2844.5715	0.2160	614.4275	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2197.8817	0.2160	474.7425	(264)
Space and water heating			1089.1699	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	311.9004	0.5190	161.8763	(268)
Total CO2, kg/m2/year			1289.9712	(272)
Emissions per m2 for space and water heating			16.3343	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4277	(272b)
Emissions per m2 for pumps and fans			0.5838	(272c)
Target Carbon Dioxide Emission Rate (TER) - (16.3343 * 1.00) 2.4277 0.5838, rounded to 2 d.p.			19.3500	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1209 (8)							
Pressure test				Yes	3.9900							
Measured/design AP50					0.3204 (18)							
Infiltration rate					2 (19)							
Number of sides sheltered												
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2724 (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	0.3473	0.3405	0.3337	0.2996	0.2928	0.2588	0.2588	0.2519	0.2724	0.2928	0.3064	0.3200 (22b)
Effective ac	0.5603	0.5580	0.5557	0.5449	0.5429	0.5335	0.5335	0.5317	0.5371	0.5429	0.5469	0.5512 (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			1.9300	1.0000	1.9300		(26)					
Opening Type 2 (Uw = 1.41)			10.5400	1.3347	14.0680		(27)					
150mm Platinum			33.3400	0.1500	5.0010		(28a)					
50 mm A. Platinum	81.0500	12.4700	68.5800	0.2700	18.5166		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1100	3.6674		(30)					
Total net area of external elements Aum(A, m ²)			147.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	43.1830	(33)					
E-WM-22			39.6800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							171.2000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4902 (36)					
Total fabric heat loss						(33) + (36) =	50.6732 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.5762	Feb 30.4484	Mar 30.3232	Apr 29.7348	May 29.6248	Jun 29.1124	Jul 29.1124	Aug 29.0175	Sep 29.3097	Oct 29.6248	Nov 29.8474	Dec 30.0802 (38)
Heat transfer coeff	81.2494	81.1216	80.9963	80.4080	80.2979	79.7855	79.7855	79.6907	79.9829	80.2979	80.5206	80.7534 (39)
Average = Sum(39)m / 12 =												80.4075 (39)
HLP	Jan 1.2185	Feb 1.2166	Mar 1.2147	Apr 1.2059	May 1.2042	Jun 1.1965	Jul 1.1965	Aug 1.1951	Sep 1.1995	Oct 1.2042	Nov 1.2076	Dec 1.2111 (40)
HLP (average)												1.2059 (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												2.1629 (42)
Average daily hot water use (litres/day)												85.5690 (43)
Daily hot water use	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy conte	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Energy content (annual)												Total = Sum(45)m = 1346.3342 (45)
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
Water storage loss:												0.0000 (46)
Total storage loss												0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF 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	34.7490	45.9885	35.9838	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											116.7213 (107)	
Space cooling per m2											1.7505 (108)	
Energy for space heating											45.9978 (99)	
Energy for space cooling											1.7505 (108)	
Total											47.7483 (109)	
Dwelling Fabric Energy Efficiency (DFEE)											47.7 (109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1209 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3709 (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) =	0.3153 (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	0.4020	0.3941	0.3862	0.3468	0.3389	0.2995	0.2995	0.2917	0.3153	0.3389	0.3547	0.3705 (22b)
Effective ac	0.5808	0.5777	0.5746	0.5601	0.5574	0.5449	0.5449	0.5425	0.5497	0.5574	0.5629	0.5686 (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			1.9300	1.0000	1.9300		(26)					
TER Opening Type (Uw = 1.40)			10.5400	1.3258	13.9735		(27)					
150mm Platinum			33.3400	0.1300	4.3342		(28a)					
50 mm A. Platinum	81.0500	12.4700	68.5800	0.1800	12.3444		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1300	4.3342		(30)					
Total net area of external elements Aum(A, m ²)			147.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.9163		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2068 (36)					
Total fabric heat loss							(33) + (36) = 45.1231 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.6951	Feb 31.5239	Mar 31.3560	Apr 30.5677	May 30.4202	Jun 29.7336	Jul 29.7336	Aug 29.6064	Sep 29.9980	Oct 30.4202	Nov 30.7186	Dec 31.0305 (38)
Heat transfer coeff	76.8182	76.6470	76.4791	75.6908	75.5433	74.8567	74.8567	74.7295	75.1211	75.5433	75.8417	76.1536 (39)
Average = Sum(39)m / 12 =												75.6901 (39)
HLP	Jan 1.1520	Feb 1.1495	Mar 1.1470	Apr 1.1351	May 1.1329	Jun 1.1226	Jul 1.1226	Aug 1.1207	Sep 1.1266	Oct 1.1329	Nov 1.1374	Dec 1.1421 (40)
HLP (average)												1.1351 (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												
Average daily hot water use (litres/day)												2.1629 (42)
Daily hot water use	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy conte	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Energy content (annual)												Total = Sum(45)m = 1346.3342 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	25.8674	37.9459	28.7017	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling											92.5150	(107)
Space cooling per m2											1.3874	(108)
Energy for space heating											44.1834	(99)
Energy for space cooling											1.3874	(108)
Total											45.5708	(109)
Target Fabric Energy Efficiency (TFEE)											52.4	(109)

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Property Reference	Belmont Mid-Terrace			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	14 FOXGLOVE DRIVE, LONGRIDGE, PR3 2RP				
SAP Rating	84 B	DER	16.60	TER	17.92
Environmental	88 B	% DER<TER	7.39		
CO₂ Emissions (t/year)	0.98	DFEE	39.14	TFEE	45.01
General Requirements Compliance	Pass	% DFEE<TFEE	13.03		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

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

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DWELLING AS BUILT

Mid-Terrace House, total floor area 67 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) 17.92 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.60 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.1 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	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.35 (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: 4.30 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC 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: 3.30 m², No overhang
Windows facing North West: 7.24 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

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 Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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) =	0.1814 (8)							
Pressure test				Yes								
Measured/design AP50				4.3000								
Infiltration rate				0.3964 (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) =		0.3370 (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	0.4296	0.4212	0.4128	0.3706	0.3622	0.3201	0.3201	0.3117	0.3370	0.3622	0.3791	0.3959 (22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5568	0.5656	0.5718	0.5784 (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			1.9300	1.0000	1.9300		(26)					
Opening Type 2 (Uw = 1.41)			10.5400	1.3347	14.0680		(27)					
150mm Platinum			33.3400	0.1300	4.3342		(28a)					
50 mm A. Platinum	41.3700	12.4700	28.9000	0.2700	7.8030		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1100	3.6674		(30)					
Total net area of external elements Aum(A, m ²)			108.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.8026	(33)					
E-WM-22			79.3600	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.8000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6537 (36)					
Total fabric heat loss						(33) + (36) =	39.4563 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 32.3215	Feb 32.1260	Mar 31.9343	Apr 31.0339	May 30.8655	Jun 30.0813	Jul 30.0813	Aug 29.9361	Sep 30.3834	Oct 30.8655	Nov 31.2063	Dec 31.5625 (38)
Heat transfer coeff	71.7778	71.5822	71.3906	70.4902	70.3218	69.5376	69.5376	69.3924	69.8397	70.3218	70.6625	71.0188 (39)
Average = Sum(39)m / 12 =												70.4894 (39)
HLP	Jan 1.0765	Feb 1.0735	Mar 1.0706	Apr 1.0571	May 1.0546	Jun 1.0429	Jul 1.0429	Aug 1.0407	Sep 1.0474	Oct 1.0546	Nov 1.0597	Dec 1.0651 (40)
HLP (average)												1.0571 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1629 (42)											
Average daily hot water use (litres/day)	85.5690 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy content (annual)	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1346.3342 (45)
Water storage loss:	20.9379	18.3124	18.8968	16.4747	15.8078	13.6410	12.6404	14.5050	14.6782	17.1061	18.6726	20.2772 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	14.0719	12.6910	14.0205	13.5338	13.9600	13.4809	13.9123	13.9432	13.5097	13.9954	13.5838	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	14.0619	(61)
Total heat required for water heating calculated for each month	153.6579	134.7739	139.9990	123.3650	119.3456	104.4207	98.1814	110.6432	111.3646	128.0359	138.0679	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	(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	153.6579	134.7739	139.9990	123.3650	119.3456	104.4207	98.1814	110.6432	111.3646	128.0359	138.0679	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	149.2436	(64)
Heat gains from water heating, kWh/month	49.9303	43.7653	45.3930	39.9023	38.5307	33.6077	31.4975	35.6386	35.9142	41.4173	44.7869	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	48.4634	(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	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6611	15.6864	12.7571	9.6579	7.2194	6.0949	6.5858	8.5604	11.4898	14.5890	17.0275	18.1519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.4278	191.3935	186.4401	175.8948	162.5834	150.0725	141.7144	139.7487	144.7021	155.2474	168.5589	181.0698	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	(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)	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	(71)
Water heating gains (Table 5)	67.1107	65.1269	61.0121	55.4199	51.7886	46.6774	42.3354	47.9013	49.8808	55.6684	62.2040	65.1390	(72)
Total internal gains	332.6432	330.6505	318.6528	299.4163	280.0350	261.2883	249.0792	254.6541	264.5164	283.9484	306.2340	322.8043	(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						
Southeast	3.3000	36.7938	0.7100	0.7000	0.7700	41.8195	(77)						
Northwest	7.2400	11.2829	0.7100	0.7000	0.7700	28.1352	(81)						
Solar gains	69.9547	128.5041	200.6480	290.2198	363.0474	377.1269	356.6388	299.7522	231.2640	148.7174	85.4915	58.7654	(83)
Total gains	402.5979	459.1546	519.3008	589.6360	643.0824	638.4153	605.7180	554.4063	495.7804	432.6657	391.7255	381.5697	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hi} (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, $n_{i,l}$ (see Table 9a)	0.9933	0.9875	0.9723	0.9256	0.8174	0.6450	0.4917	0.5521	0.7997	0.9539	0.9880	0.9946	(86)
MIT	19.5700	19.7477	20.0495	20.4477	20.7690	20.9400	20.9853	20.9763	20.8461	20.4267	19.9303	19.5396	(87)
Th 2	20.0201	20.0225	20.0249	20.0360	20.0381	20.0478	20.0478	20.0496	20.0440	20.0381	20.0339	20.0295	(88)
util rest of house	0.9916	0.9844	0.9651	0.9059	0.7714	0.5663	0.3914	0.4483	0.7333	0.9377	0.9844	0.9933	(89)
MIT 2	18.1083	18.3682	18.8057	19.3754	19.8002	20.0022	20.0407	20.0371	19.9079	19.3582	18.6432	18.0704	(90)
Living area fraction	18.4152	18.6578	19.0668	19.6005	20.0036	20.1991	20.2390	20.2343	20.1049	19.5825	18.9134	18.3789	(92)
Temperature adjustment	18.2652	18.5078	18.9168	19.4505	19.8536	20.0491	20.0890	20.0843	19.9549	19.4325	18.7634	18.2289	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	397.3942	448.8134	495.4584	525.4525	489.6652	361.6372	239.7968	250.7335	360.0300	399.8731	382.9327	377.5511	(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	1002.3900	974.0799	886.4450	743.7070	573.3758	378.9146	242.6195	255.6613	408.9016	621.1206	824.1685	996.3141	(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	450.1169	352.9791	290.8940	157.1433	62.2807	0.0000	0.0000	0.0000	0.0000	164.6081	317.6898	460.3597	(98)	
Space heating per m2												2256.0715	(98)	
												(98) / (4) =	33.8343	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

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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													2492.8967	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	450.1169	352.9791	290.8940	157.1433	62.2807	0.0000	0.0000	0.0000	0.0000	164.6081	317.6898	460.3597	2492.8967	(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)	497.3667	390.0321	321.4298	173.6390	68.8184	0.0000	0.0000	0.0000	0.0000	181.8874	351.0384	508.6847	2492.8967	(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	153.6579	134.7739	139.9990	123.3650	119.3456	104.4207	98.1814	110.6432	111.3646	128.0359	138.0679	149.2436	1492.4685	(64)
Efficiency of water heater (217)m	89.6636	89.5926	89.4349	89.0642	88.3715	87.3000	87.3000	87.3000	87.3000	89.0715	89.5061	87.3000	89.6951	(216)
Fuel for water heating, kWh/month	171.3717	150.4298	156.5374	138.5124	135.0499	119.6113	112.4644	126.7391	127.5655	143.7450	154.2553	166.3899	1702.6715	(219)
Water heating fuel used													1702.6715	(219)
Annual totals kWh/year													2492.8967	(211)
Space heating fuel - main system													0.0000	(215)
Space heating fuel - secondary													2492.8967	(211)
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													311.9004	(232)
Electricity for lighting (calculated in Appendix L)													4582.4685	(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	2492.8967	0.2160	538.4657 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1702.6715	0.2160	367.7770 (264)
Space and water heating			906.2427 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	311.9004	0.5190	161.8763 (268)
Total CO2, kg/year			1107.0440 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6000 (273)

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

	TFA	N	EF	
DER				16.6000 ZC1
Total Floor Area				66.6800
Assumed number of occupants				2.1629
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190
CO2 emissions from appliances, equation (L14)				16.8343 ZC2
CO2 emissions from cooking, equation (L16)				2.5631 ZC3
Total CO2 emissions				35.9974 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				35.9974 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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				2 * 10 =	20.0000 (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)				20.0000 / (5) =	0.1209 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3709 (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) =		0.3153 (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	0.4020	0.3941	0.3862	0.3468	0.3389	0.2995	0.2995	0.2917	0.3153	0.3389	0.3547	0.3705 (22b)
Effective ac	0.5808	0.5777	0.5746	0.5601	0.5574	0.5449	0.5449	0.5425	0.5497	0.5574	0.5629	0.5686 (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			1.9300	1.0000	1.9300		(26)					
TER Opening Type (Uw = 1.40)			10.5400	1.3258	13.9735		(27)					
150mm Platinum			33.3400	0.1300	4.3342		(28a)					
50 mm A. Platinum	41.3700	12.4700	28.9000	0.1800	5.2020		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1300	4.3342		(30)					
Total net area of external elements Aum(A, m ²)			108.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 29.7739		(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)							7.7492 (36)					
Total fabric heat loss						(33) + (36) =	37.5231 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.6951	Feb 31.5239	Mar 31.3560	Apr 30.5677	May 30.4202	Jun 29.7336	Jul 29.7336	Aug 29.6064	Sep 29.9980	Oct 30.4202	Nov 30.7186	Dec 31.0305 (38)
Heat transfer coeff	69.2182	69.0470	68.8791	68.0908	67.9433	67.2567	67.2567	67.1295	67.5211	67.9433	68.2417	68.5536 (39)
Average = Sum(39)m / 12 =												68.0901 (39)
HLP	Jan 1.0381	Feb 1.0355	Mar 1.0330	Apr 1.0212	May 1.0189	Jun 1.0086	Jul 1.0086	Aug 1.0067	Sep 1.0126	Oct 1.0189	Nov 1.0234	Dec 1.0281 (40)
HLP (average)												1.0211 (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												2.1629 (42)
Average daily hot water use (litres/day)												85.5690 (43)
Daily hot water use	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy conte	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Energy content (annual)												Total = Sum(45)m = 1346.3342 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	20.9379	18.3124	18.8968	16.4747	15.8078	13.6410	12.6404	14.5050	14.6782	17.1061	18.6726	20.2772 (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 Built)

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)	
	47.9655	41.7483	44.4771	41.3545	40.9887	37.9786	39.2445	40.9887	41.3545	44.4771	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	44.7303	(61)
Total heat required for water heating calculated for each month	187.5516	163.8312	170.4557	151.1856	146.3744	128.9184	123.5136	137.6887	139.2094	158.5176	169.2144	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	(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	187.5516	163.8312	170.4557	151.1856	146.3744	128.9184	123.5136	137.6887	139.2094	158.5176	169.2144	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	183.1472	(64)
Heat gains from water heating, kWh/month	58.4037	51.0296	53.0072	46.8575	45.2879	39.7321	37.8306	42.3999	42.8754	49.0377	52.5735	56.9393	56.9393	56.9393	56.9393	56.9393	56.9393	56.9393	56.9393	56.9393	56.9393	56.9393	56.9393	(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	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	108.1453	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6611	15.6864	12.7571	9.6579	7.2194	6.0949	6.5858	8.5604	11.4898	14.5890	17.0275	18.1519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.4278	191.3935	186.4401	175.8948	162.5834	150.0725	141.7144	139.7487	144.7021	155.2474	168.5589	181.0698	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	33.8145	(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)	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	-86.5163	(71)
Water heating gains (Table b)	78.4997	75.9369	71.2462	65.0798	60.8708	55.1835	50.8476	56.9892	59.5491	65.9109	73.0188	76.5313	(72)
Total internal gains	344.0322	341.4605	328.8869	309.0762	289.1172	269.7945	257.5914	263.7419	274.1847	294.1909	317.0487	334.1966	(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								
Southeast	3.3000	36.7938	0.6300	0.7000	0.7700	37.1074 (77)							
Northwest	7.2400	11.2829	0.6300	0.7000	0.7700	24.9651 (81)							
Solar gains	62.0725	114.0248	178.0398	257.5189	322.1407	334.6337	316.4541	265.9773	205.2061	131.9605	75.8587	52.1440	(83)
Total gains	406.1047	455.4853	506.9267	566.5951	611.2579	604.4282	574.0455	529.7192	479.3908	426.1514	392.9074	386.3406	(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	66.8979	67.0639	67.2273	68.0056	68.1533	68.8490	68.8490	68.9794	68.5794	68.1533	67.8553	67.5465	
alpha	5.4599	5.4709	5.4818	5.5337	5.5436	5.5899	5.5899	5.5986	5.5720	5.5436	5.5237	5.5031	
util living area	0.9979	0.9955	0.9879	0.9569	0.8609	0.6777	0.5093	0.5707	0.8355	0.9750	0.9955	0.9984	(86)
MIT	19.9206	20.0532	20.2834	20.5937	20.8475	20.9699	20.9948	20.9907	20.9056	20.5800	20.1964	19.8966	(87)
Th 2	20.0517	20.0539	20.0559	20.0657	20.0676	20.0761	20.0761	20.0777	20.0728	20.0676	20.0639	20.0600	(88)
util rest of house	0.9971	0.9940	0.9836	0.9414	0.8149	0.5938	0.4057	0.4626	0.7662	0.9631	0.9937	0.9978	(89)
MIT 2	18.6085	18.8033	19.1388	19.5864	19.9187	20.0563	20.0742	20.0738	19.9967	19.5755	19.0202	18.5795	(90)
Living area fraction	FLA = Living area / (4) =												0.2100 (91)
MIT	18.8840	19.0657	19.3791	19.7979	20.1138	20.2481	20.2675	20.2663	20.1875	19.7864	19.2672	18.8560	(92)
Temperature adjustment													0.0000
adjusted MIT	18.8840	19.0657	19.3791	19.7979	20.1138	20.2481	20.2675	20.2663	20.1875	19.7864	19.2672	18.8560	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	404.4174	451.7396	496.5414	530.2503	499.6622	368.8332	245.4062	257.0821	371.9387	408.3876	389.5629	385.1022	(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	1009.4766	978.1001	887.1039	742.0451	571.6582	379.8722	246.6629	259.5433	411.0352	624.1537	830.3073	1004.7225	(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	450.1640	353.7142	290.5785	152.4923	53.5650	0.0000	0.0000	0.0000	0.0000	160.5300	317.3359	460.9975	(98)
Space heating													2239.3776 (98)
Space heating per m2													(98) / (4) = 33.5839 (99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2397.6205 (211)
Space heating requirement	450.1640	353.7142	290.5785	152.4923	53.5650	0.0000	0.0000	0.0000	0.0000	160.5300	317.3359	460.9975	(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)	481.9744	378.7090	311.1119	163.2680	57.3501	0.0000	0.0000	0.0000	0.0000	171.8737	339.7601	493.5734	(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	187.5516	163.8312	170.4557	151.1856	146.3744	128.9184	123.5136	137.6887	139.2094	158.5176	169.2144	183.1472	(64)
Efficiency of water heater (217)m	87.1753	86.9385	86.3829	85.0729	82.7777	80.3000	80.3000	80.3000	80.3000	85.0830	86.6113	87.2787	(217)
Fuel for water heating, kWh/month	215.1431	188.4449	197.3257	177.7131	176.8282	160.5459	153.8152	171.4679	173.3616	186.3095	195.3722	209.8417	(219)
Water heating fuel used													2206.1691 (219)
Annual totals kWh/year													
Space heating fuel - main system													2397.6205 (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)													311.9004 (232)
Total delivered energy for all uses													4990.6900 (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	2397.6205	0.2160	517.8860 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2206.1691	0.2160	476.5325 (264)
Space and water heating			994.4186 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	311.9004	0.5190	161.8763 (268)
Total CO2, kg/m2/year			1195.2199 (272)
Emissions per m2 for space and water heating			14.9133 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4277 (272b)
Emissions per m2 for pumps and fans			0.5838 (272c)
Target Carbon Dioxide Emission Rate (TER) - (14.9133 * 1.00) 2.4277 0.5838, rounded to 2 d.p.			17.9200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1209 (8)							
Pressure test				Yes								
Measured/design AP50				4.3000								
Infiltration rate				0.3359 (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) =		0.2856 (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	0.3641	0.3569	0.3498	0.3141	0.3070	0.2713	0.2713	0.2641	0.2856	0.3070	0.3212	0.3355 (22b)
Effective ac	0.5663	0.5637	0.5612	0.5493	0.5471	0.5368	0.5368	0.5349	0.5408	0.5471	0.5516	0.5563 (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			1.9300	1.0000	1.9300		(26)					
Opening Type 2 (Uw = 1.41)			10.5400	1.3347	14.0680		(27)					
150mm Platinum			33.3400	0.1300	4.3342		(28a)					
50 mm A. Platinum	41.3700	12.4700	28.9000	0.2700	7.8030		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1100	3.6674		(30)					
Total net area of external elements Aum(A, m ²)			108.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.8026	(33)					
E-WM-22			79.3600	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.8000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6537 (36)					
Total fabric heat loss						(33) + (36) =	39.4563 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.9022	Feb 30.7618	Mar 30.6241	Apr 29.9775	May 29.8566	Jun 29.2934	Jul 29.2934	Aug 29.1891	Sep 29.5103	Oct 29.8566	Nov 30.1013	Dec 30.3571 (38)
Heat transfer coeff	70.3585	70.2181	70.0804	69.4338	69.3128	68.7497	68.7497	68.6454	68.9666	69.3128	69.5576	69.8134 (39)
Average = Sum(39)m / 12 =												69.4332 (39)
HLP	Jan 1.0552	Feb 1.0531	Mar 1.0510	Apr 1.0413	May 1.0395	Jun 1.0310	Jul 1.0310	Aug 1.0295	Sep 1.0343	Oct 1.0395	Nov 1.0432	Dec 1.0470 (40)
HLP (average)												1.0413 (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												2.1629 (42)
Average daily hot water use (litres/day)												85.5690 (43)
Daily hot water use	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy conte	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Energy content (annual)												Total = Sum(45)m = 1346.3342 (45)
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
Water storage loss:												0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF 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	40.6683	53.2695	42.0167	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											135.9545 (107)	
Space cooling per m2											2.0389 (108)	
Energy for space heating											37.1012 (99)	
Energy for space cooling											2.0389 (108)	
Total											39.1402 (109)	
Dwelling Fabric Energy Efficiency (DFEE)											39.1 (109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.3400 (1b)	2.3300 (2b)	77.6822 (1b) - (3b)
First floor	33.3400 (1c)	2.6300 (2c)	87.6842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.6800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 165.3664 (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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1209 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3709 (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) =	0.3153 (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	0.4020	0.3941	0.3862	0.3468	0.3389	0.2995	0.2995	0.2917	0.3153	0.3389	0.3547	0.3705 (22b)
Effective ac	0.5808	0.5777	0.5746	0.5601	0.5574	0.5449	0.5449	0.5425	0.5497	0.5574	0.5629	0.5686 (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			1.9300	1.0000	1.9300		(26)					
TER Opening Type (Uw = 1.40)			10.5400	1.3258	13.9735		(27)					
150mm Platinum			33.3400	0.1300	4.3342		(28a)					
50 mm A. Platinum	41.3700	12.4700	28.9000	0.1800	5.2020		(29a)					
400mm Mineral wool	33.3400		33.3400	0.1300	4.3342		(30)					
Total net area of external elements Aum(A, m ²)			108.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 29.7739		(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)							7.7492 (36)					
Total fabric heat loss							(33) + (36) = 37.5231 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.6951	Feb 31.5239	Mar 31.3560	Apr 30.5677	May 30.4202	Jun 29.7336	Jul 29.7336	Aug 29.6064	Sep 29.9980	Oct 30.4202	Nov 30.7186	Dec 31.0305 (38)
Heat transfer coeff	69.2182	69.0470	68.8791	68.0908	67.9433	67.2567	67.2567	67.1295	67.5211	67.9433	68.2417	68.5536 (39)
Average = Sum(39)m / 12 =												68.0901 (39)
HLP	Jan 1.0381	Feb 1.0355	Mar 1.0330	Apr 1.0212	May 1.0189	Jun 1.0086	Jul 1.0086	Aug 1.0067	Sep 1.0126	Oct 1.0189	Nov 1.0234	Dec 1.0281 (40)
HLP (average)												1.0211 (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												2.1629 (42)
Average daily hot water use (litres/day)												85.5690 (43)
Daily hot water use	94.1259	90.7032	87.2804	83.8577	80.4349	77.0121	77.0121	80.4349	83.8577	87.2804	90.7032	94.1259 (44)
Energy conte	139.5861	122.0829	125.9786	109.8312	105.3856	90.9398	84.2691	96.7000	97.8549	114.0404	124.4841	135.1816 (45)
Energy content (annual)												Total = Sum(45)m = 1346.3342 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	31.4604	44.5599	34.3874	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling											110.4077	(107)
Space cooling per m2											1.6558	(108)
Energy for space heating											37.4793	(99)
Energy for space cooling											1.6558	(108)
Total											39.1351	(109)
Target Fabric Energy Efficiency (TFEE)											45.0	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Brandon End-Terrace BeamBlock			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 182, Chipping Lane , Longridge , PR3				
SAP Rating	83 B	DER	18.41	TER	19.44
Environmental	87 B	% DER<TER	5.32		
CO₂ Emissions (t/year)	1.07	DFEE	46.93	TFEE	52.43
General Requirements Compliance	Pass	% DFEE<TFEE	10.49		
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 64 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) 19.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.41 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.9 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	1.35 (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

OK

Minimum: 88.0%

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: 3.44 m², No overhang

Windows facing South West: 1.32 m², No overhang

Windows facing North West: 6.45 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

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	32.2000 (1b)	x 2.3100 (2b)	= 74.3820 (1b) - (3b)
First floor	32.2000 (1c)	x 2.5600 (2c)	= 82.4320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.8140 (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) = 0.1913 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4418 (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) = 0.3755 (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	0.4788	0.4694	0.4600	0.4131	0.4037	0.3568	0.3568	0.3474	0.3755	0.4037	0.4225	0.4413 (22b)
Effective ac	0.6146	0.6102	0.6058	0.5853	0.5815	0.5636	0.5636	0.5603	0.5705	0.5815	0.5892	0.5974 (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)			11.2100	1.3347	14.9622		(27)					
Opening Type 9			1.9700	1.0000	1.9700		(26)					
150mm B&B			32.2000	0.1400	4.5080		(28a)					
50mm Alreflex Plat	78.2900	13.1800	65.1100	0.2700	17.5797		(29a)					
400mm mineral	32.2000		32.2000	0.1100	3.5420		(30)					
Total net area of external elements Aum(A, m ²)			142.6900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.5619		(33)					
E-WM-20/22			37.2800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							176.5300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3199 (36)					
Total fabric heat loss						(33) + (36) =	48.8818 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.8063	Feb 31.5759	Mar 31.3501	Apr 30.2896	May 30.0912	Jun 29.1676	Jul 29.1676	Aug 28.9965	Sep 29.5233	Oct 30.0912	Nov 30.4926	Dec 30.9122 (38)
Heat transfer coeff	80.6880	80.4577	80.2319	79.1714	78.9730	78.0493	78.0493	77.8783	78.4051	78.9730	79.3744	79.7940 (39)
Average = Sum(39)m / 12 =												79.1705 (39)
HLP	Jan 1.2529	Feb 1.2493	Mar 1.2458	Apr 1.2294	May 1.2263	Jun 1.2119	Jul 1.2119	Aug 1.2093	Sep 1.2175	Oct 1.2263	Nov 1.2325	Dec 1.2390 (40)
HLP (average)												1.2294 (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												2.1029 (42)
Average daily hot water use (litres/day)												84.1444 (43)
Daily hot water use	92.5589	89.1931	85.8273	82.4615	79.0958	75.7300	75.7300	79.0958	82.4615	85.8273	89.1931	92.5589 (44)
Energy conte	137.2621	120.0503	123.8812	108.0026	103.6311	89.4257	82.8661	95.0901	96.2257	112.1418	122.4116	132.9310 (45)
Energy content (annual)												Total = Sum(45)m = 1323.9193 (45)
Distribution loss (46)m = 0.15 x (45)m	20.5893	18.0075	18.5822	16.2004	15.5447	13.4139	12.4299	14.2635	14.4339	16.8213	18.3617	19.9397 (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	14.0615	12.6823	14.0117	13.5265	13.9533	13.4753	13.9072	13.9371	13.5032	13.9876	13.5748	14.0519	14.0519	14.0519	14.0519	14.0519	14.0519	14.0519	14.0519	14.0519	14.0519	14.0519	14.0519	(61)
Total heat required for water heating calculated for each month	151.3236	132.7326	137.8929	121.5292	117.5844	102.9011	96.7733	109.0271	109.7290	126.1294	135.9864	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	(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	151.3236	132.7326	137.8929	121.5292	117.5844	102.9011	96.7733	109.0271	109.7290	126.1294	135.9864	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	146.9829	(64)
Heat gains from water heating, kWh/month	49.1550	43.0873	44.6934	39.2925	37.9457	33.1029	31.0298	35.1017	35.3709	40.7840	44.0956	47.7125	47.7125	47.7125	47.7125	47.7125	47.7125	47.7125	47.7125	47.7125	47.7125	47.7125	47.7125	(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	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	105.1461	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.8378	14.9552	12.1624	9.2077	6.8829	5.8108	6.2708	8.1614	10.9542	13.9089	16.2337	17.3058	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.8921	185.8004	180.9917	170.7546	157.8322	145.6868	137.5730	135.6648	140.4735	150.7106	163.6330	175.7783	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5146	33.5146	33.5146	33.5146	33.5146	33.5146	33.5146	33.5146	33.5146	33.5146	33.5146	33.5146	(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)	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	-84.1169	(71)	
Water heating gains (Table 5)	66.0686	64.1180	60.0718	54.5729	51.0022	45.9762	41.7067	47.1797	49.1262	54.8173	61.2438	64.1297	(72)	
Total internal gains	324.3424	322.4174	310.7697	292.0791	273.2611	255.0177	243.1023	248.5498	258.0977	276.9806	298.6544	314.7577	(73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	α Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast	3.4400	36.7938	0.7100	0.7100	0.7000	0.7700	43.5936 (77)						
Southwest	1.3200	36.7938	0.7100	0.7100	0.7000	0.7700	16.7278 (79)						
Northwest	6.4500	11.2829	0.7100	0.7100	0.7000	0.7700	25.0652 (81)						
Solar gains	85.3867	153.7707	232.5102	325.1586	398.0379	410.0416	389.1306	332.4842	264.2359	175.9120	103.7897	72.0921	(83)
Total gains	409.7290	476.1881	543.2800	617.2377	671.2990	665.0594	632.2330	581.0340	522.3337	452.8926	402.4441	386.8498	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.1375	39.2495	39.3600	39.8872	39.9874	40.4606	40.4606	40.5495	40.2770	39.9874	39.7852	39.5760	
alpha	3.6092	3.6166	3.6240	3.6591	3.6658	3.6974	3.6974	3.7033	3.6851	3.6658	3.6523	3.6394	
util living area	0.9905	0.9829	0.9652	0.9182	0.8195	0.6633	0.5156	0.5726	0.8001	0.9460	0.9839	0.9922	(86)
MIT	19.2538	19.4645	19.8131	20.2706	20.6561	20.8907	20.9674	20.9522	20.7699	20.2670	19.6821	19.2202	(87)
Th 2	19.8779	19.8807	19.8835	19.8966	19.8990	19.9105	19.9105	19.9126	19.9060	19.8990	19.8941	19.8889	(88)
util rest of house	0.9881	0.9787	0.9563	0.8965	0.7713	0.5774	0.3997	0.4550	0.7295	0.9272	0.9792	0.9903	(89)
MIT 2	17.5636	17.8712	18.3757	19.0301	19.5445	19.8268	19.8949	19.8874	19.7029	19.0397	18.1982	17.5217	(90)
Living area fraction	18.0135	18.2952	18.7583	19.3603	19.8403	20.1100	20.1803	20.1708	19.9869	19.3663	18.5931	17.9738	(92)
Temperature adjustment	17.8635	18.1452	18.6083	19.2103	19.6903	19.9600	20.0303	20.0208	19.8369	19.2163	18.4431	17.8238	(93)
adjusted MIT	17.8635	18.1452	18.6083	19.2103	19.6903	19.9600	20.0303	20.0208	19.8369	19.2163	18.4431	17.8238	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	402.2551	461.5320	512.0103	542.9001	510.6765	386.8148	261.1820	271.6615	378.3140	412.8466	390.4058	380.9951	(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	1094.4104	1065.6814	971.4700	816.2795	631.0188	418.3446	267.7361	281.9831	449.8010	680.4569	900.3531	1087.0940	(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	514.9636	405.9884	341.8381	196.8331	89.5347	0.0000	0.0000	0.0000	0.0000	199.1021	367.1621	525.3376	(98)
Space heating													2640.7596 (98)
Space heating per m2													41.0056 (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													2917.9665 (211)
Space heating requirement	514.9636	405.9884	341.8381	196.8331	89.5347	0.0000	0.0000	0.0000	0.0000	199.1021	367.1621	525.3376	(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)	569.0205	448.6060	377.7216	217.4952	98.9334	0.0000	0.0000	0.0000	0.0000	220.0023	405.7040	580.4835	(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	151.3236	132.7326	137.8929	121.5292	117.5844	102.9011	96.7733	109.0271	109.7290	126.1294	135.9864	146.9829	(64)
Efficiency of water heater (217)m	89.7528	89.6900	89.5564	89.2512	88.6551	87.3000	87.3000	87.3000	87.3000	89.2315	89.6122	89.7805	(217)
Fuel for water heating, kWh/month	168.6004	147.9904	153.9732	136.1654	132.6312	117.8706	110.8514	124.8879	125.6918	141.3507	151.7498	163.7135	(219)
Water heating fuel used													1675.4764 (219)
Annual totals kWh/year													
Space heating fuel - main system													2917.9665 (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)													297.3610 (232)
Total delivered energy for all uses													4965.8039 (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	2917.9665	0.2160	630.2808 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1675.4764	0.2160	361.9029 (264)
Space and water heating			992.1837 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	297.3610	0.5190	154.3304 (268)
Total CO2, kg/year			1185.4390 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4100 (273)

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

DER			18.4100 ZC1
Total Floor Area		TFA	64.4000
Assumed number of occupants		N	2.1029
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.9209 ZC2
CO2 emissions from cooking, equation (L16)			2.6315 ZC3
Total CO2 emissions			37.9624 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			37.9624 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	32.2000 (1b)	x 2.3100 (2b)	= 74.3820 (1b) - (3b)
First floor	32.2000 (1c)	x 2.5600 (2c)	= 82.4320 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.8140 (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					2 * 10 = 20.0000 (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)					20.0000 / (5) = 0.1275 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3775 (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) =	0.3209 (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	0.4092	0.4011	0.3931	0.3530	0.3450	0.3049	0.3049	0.2968	0.3209	0.3450	0.3610	0.3771 (22b)
Effective ac	0.5837	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (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)			11.2100	1.3258	14.8617		(27)					
150mm B&B			32.2000	0.1300	4.1860		(28a)					
50mm Alreflex Plat	78.2900	13.1800	65.1100	0.1800	11.7198		(29a)					
400mm mineral	32.2000		32.2000	0.1300	4.1860		(30)					
Total net area of external elements Aum(A, m ²)			142.6900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		36.9235 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6496 (36)					
Total fabric heat loss						(33) + (36) =	45.5731 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.2059	Feb 30.0377	Mar 29.8729	Apr 29.0985	May 28.9536	Jun 28.2791	Jul 28.2791	Aug 28.1542	Sep 28.5389	Oct 28.9536	Nov 29.2467	Dec 29.5531 (38)
Heat transfer coeff	75.7791	75.6109	75.4460	74.6716	74.5267	73.8523	73.8523	73.7273	74.1121	74.5267	74.8198	75.1263 (39)
Average = Sum(39)m / 12 =												74.6709 (39)
HLP	Jan 1.1767	Feb 1.1741	Mar 1.1715	Apr 1.1595	May 1.1572	Jun 1.1468	Jul 1.1468	Aug 1.1448	Sep 1.1508	Oct 1.1572	Nov 1.1618	Dec 1.1666 (40)
HLP (average)												1.1595 (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												2.1029 (42)
Average daily hot water use (litres/day)												84.1444 (43)
Daily hot water use	92.5589	89.1931	85.8273	82.4615	79.0958	75.7300	75.7300	79.0958	82.4615	85.8273	89.1931	92.5589 (44)
Energy conte	137.2621	120.0503	123.8812	108.0026	103.6311	89.4257	82.8661	95.0901	96.2257	112.1418	122.4116	132.9310 (45)
Energy content (annual)												Total = Sum(45)m = 1323.9193 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	20.5893	18.0075	18.5822	16.2004	15.5447	13.4139	12.4299	14.2635	14.4339	16.8213	18.3617	19.9397 (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												