

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1490 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.3995 (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) =		0.3396 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4330	0.4245	0.4160	0.3736	0.3651	0.3226	0.3226	0.3141	0.3396	0.3651	0.3821	0.3990 (22b)
	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5577	0.5666	0.5730	0.5796 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Opening Type 1 (Uw = 1.41)			18.8700	1.3347	25.1862		(27)					
Opening Type 4			1.9700	1.0000	1.9700		(26)					
Opening Type 12			1.9700	1.7000	3.3490		(26a)					
150mm TE Platinum GF			55.1100	0.1500	8.2665		(28a)					
50mm Aireflex Plat	145.6100	22.8100	122.8000	0.2700	33.1560		(29a)					
400mm Mineral Wool	55.1500		55.1500	0.1100	6.0665		(30)					
Total net area of external elements Aum(A, m ²)			255.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		77.9942 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							152.4500 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9377 (36)					
Total fabric heat loss						(33) + (36) =	87.9319 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 52.5864	Feb 52.2640	Mar 51.9479	Apr 50.4636	May 50.1859	Jun 48.8931	Jul 48.8931	Aug 48.6537	Sep 49.3910	Oct 50.1859	Nov 50.7477	Dec 51.3350 (38)
Heat transfer coeff	140.5182	140.1958	139.8798	138.3955	138.1178	136.8249	136.8249	136.5855	137.3229	138.1178	138.6796	139.2669 (39)
Average = Sum(39)m / 12 =												138.3941 (39)
HLP	Jan 1.2749	Feb 1.2720	Mar 1.2691	Apr 1.2556	May 1.2531	Jun 1.2414	Jul 1.2414	Aug 1.2392	Sep 1.2459	Oct 1.2531	Nov 1.2582	Dec 1.2635 (40)
HLP (average)												1.2556 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.8161 (42)
Average daily hot water use (litres/day)												101.0833 (43)
Daily hot water use	111.1917	107.1483	103.1050	99.0617	95.0183	90.9750	90.9750	95.0183	99.0617	103.1050	107.1483	111.1917 (44)
Energy conte	164.8940	144.2174	148.8194	129.7444	124.4928	107.4278	99.5477	114.2324	115.5967	134.7168	147.0539	159.6911 (45)
Energy content (annual)												Total = Sum(45)m = 1590.4343 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	35.0400	30.6462	31.6241	27.5707	26.4547	22.8284	21.1539	24.2744	24.5643	28.6273	31.2490	33.9343	33.9343	(65)

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

Metabolic gains (Table 5), Watts														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9662	22.1747	18.0337	13.6527	10.2055	8.6159	9.3098	12.1013	16.2423	20.6233	24.0705	25.6601	25.6601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8717	274.6929	267.5836	252.4488	233.3438	215.3879	203.3922	200.5710	207.6803	222.8151	241.9200	259.8760	259.8760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	(71)
Water heating gains (Table 5)	47.0967	45.6044	42.5055	38.2926	35.5574	31.7061	28.4326	32.6269	34.1171	38.4776	43.4013	45.6107	45.6107	(72)
Total internal gains	409.1767	407.7142	393.3650	369.6362	344.3489	320.9520	306.3767	310.5412	323.2817	347.1581	374.6339	396.3889	396.3889	(73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	FF	Access	Gains								
	m2	Table 6a	g		factor	W								
		W/m2	or Table 6b	Specific data	Table 6d									
				or Table 6c										
Southeast	8.8700	36.7938	0.7100	0.7000	0.7700	112.4057 (77)								
Northwest	10.0000	11.2829	0.7100	0.7000	0.7700	38.8608 (81)								
Solar gains	151.2665	270.5708	404.4927	558.6546	678.1942	696.3629	661.7662	569.0568	457.3235	308.2828	183.5331	127.9315	127.9315	(83)
Total gains	560.4432	678.2850	797.8577	928.2908	1022.5431	1017.3149	968.1429	879.5980	780.6053	655.4408	558.1670	524.3204	524.3204	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													
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	33.2164	33.2928	33.3680	33.7259	33.7937	34.1130	34.1130	34.1728	33.9893	33.7937	33.6568	33.5149	21.0000 (85)
alpha	3.2144	3.2195	3.2245	3.2484	3.2529	3.2742	3.2742	3.2782	3.2660	3.2529	3.2438	3.2343	
util living area	0.9924	0.9853	0.9695	0.9286	0.8436	0.7057	0.5647	0.6255	0.8337	0.9561	0.9872	0.9938	0.9938 (86)
MIT	18.8641	19.1033	19.5010	20.0259	20.4939	20.8102	20.9334	20.9060	20.6434	20.0286	19.3508	18.8243	18.8243 (87)
Th 2	19.8606	19.8629	19.8651	19.8758	19.8777	19.8870	19.8870	19.8888	19.8835	19.8777	19.8737	19.8695	19.8695 (88)
util rest of house	0.9906	0.9820	0.9622	0.9104	0.8014	0.6234	0.4435	0.5059	0.7722	0.9414	0.9837	0.9924	0.9924 (89)
MIT 2	17.9145	18.1537	18.5488	19.0679	19.5058	19.7797	19.8626	19.8508	19.6534	19.0808	18.4093	17.8813	17.8813 (90)
Living area fraction									fLA = Living area / (4) =				
MIT	18.0936	18.3328	18.7284	19.2486	19.6922	19.9741	20.0646	20.0498	19.8401	19.2596	18.5869	18.0591	18.0591 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	18.0936	18.3328	18.7284	19.2486	19.6922	19.9741	20.0646	20.0498	19.8401	19.2596	18.5869	18.0591	18.0591 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9868	0.9758	0.9525	0.8978	0.7932	0.6305	0.4643	0.5249	0.7693	0.9307	0.9781	0.9892 (94)
Useful gains	553.0223	661.8591	759.9418	833.3995	811.1305	641.4622	449.5311	461.6943	600.5207	610.0490	545.9452	518.6568 (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	1938.2516	1883.2270	1710.5019	1432.2003	1103.8663	735.3079	474.0388	498.5097	788.2475	1196.0405	1592.9946	1930.1177 (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	1030.6106	820.7593	707.2168	431.1366	217.7954	0.0000	0.0000	0.0000	0.0000	435.9776	753.8755	1050.1269 (98)
Space heating												5447.4987 (98)
Space heating per m2												49.4239 (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	1286.1545	1012.5046	1038.0501	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7700	0.8369	0.8003	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	990.3788	847.3793	830.7488	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1299.6868	1239.8063	1138.4068	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	222.7018	291.9658	228.8976	0.0000	0.0000	0.0000	0.0000 (104)	
Space cooling												743.5651 (104)	

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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	55.6754	72.9914	57.2244	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling										185.8913	(107)	
Space cooling per m2										1.6865	(108)	
Energy for space heating										49.4239	(99)	
Energy for space cooling										1.6865	(108)	
Total										51.1104	(109)	
Dwelling Fabric Energy Efficiency (DFEE)										51.1	(109)	

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1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1490 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.3990 (18)								
Number of sides sheltered				2 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3392 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4325	0.4240	0.4155	0.3731	0.3646	0.3222	0.3222	0.3137	0.3392	0.3646	0.3816	0.3985 (22b)
Effective ac	0.5935	0.5899	0.5863	0.5696	0.5665	0.5519	0.5519	0.5492	0.5575	0.5665	0.5728	0.5794 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			1.9700	1.0000	1.9700		(26)					
TER Semi-glazed door			1.9700	1.2000	2.3640		(26a)					
TER Opening Type (Uw = 1.40)			18.8700	1.3258	25.0170		(27)					
150mm TE Platinum GF			55.1100	0.1300	7.1643		(28a)					
50mm Aireflex Plat	145.6100	22.8100	122.8000	0.1800	22.1040		(29a)					
400mm Mineral Wool	55.1500		55.1500	0.1300	7.1695		(30)					
Total net area of external elements Aum(A, m ²)			255.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	65.7888	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.6782 (36)					
Total fabric heat loss							(33) + (36) = 77.4670 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 52.5656	Feb 52.2440	Mar 51.9288	Apr 50.4481	May 50.1711	Jun 48.8815	Jul 48.8815	Aug 48.6427	Sep 49.3783	Oct 50.1711	Nov 50.7315	Dec 51.3174 (38)
Heat transfer coeff	130.0326	129.7110	129.3958	127.9152	127.6382	126.3486	126.3486	126.1098	126.8453	127.6382	128.1986	128.7845 (39)
Average = Sum(39)m / 12 =												127.9139 (39)
HLP	Jan 1.1798	Feb 1.1768	Mar 1.1740	Apr 1.1605	May 1.1580	Jun 1.1463	Jul 1.1463	Aug 1.1442	Sep 1.1508	Oct 1.1580	Nov 1.1631	Dec 1.1684 (40)
HLP (average)												1.1605 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.8161 (42)
Average daily hot water use (litres/day)												101.0833 (43)
Daily hot water use	111.1917	107.1483	103.1050	99.0617	95.0183	90.9750	90.9750	95.0183	99.0617	103.1050	107.1483	111.1917 (44)
Energy conte	164.8940	144.2174	148.8194	129.7444	124.4928	107.4278	99.5477	114.2324	115.5967	134.7168	147.0539	159.6911 (45)
Energy content (annual)												Total = Sum(45)m = 1590.4343 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	35.0400	30.6462	31.6241	27.5707	26.4547	22.8284	21.1539	24.2744	24.5643	28.6273	31.2490	33.9343	33.9343	33.9343	(65)

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

Metabolic gains (Table 5), Watts														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	140.8070	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9662	22.1747	18.0337	13.6527	10.2055	8.6159	9.3098	12.1013	16.2423	20.6233	24.0705	25.6601	25.6601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8717	274.6929	267.5836	252.4488	233.3438	215.3879	203.3922	200.5710	207.6803	222.8151	241.9200	259.8760	259.8760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	37.0807	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	-112.6456	(71)
Water heating gains (Table 5)	47.0967	45.6044	42.5055	38.2926	35.5574	31.7061	28.4326	32.6269	34.1171	38.4776	43.4013	45.6107	45.6107	(72)
Total internal gains	409.1767	407.7142	393.3650	369.6362	344.3489	320.9520	306.3767	310.5412	323.2817	347.1581	374.6339	396.3889	396.3889	(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						
Southeast	8.8700	36.7938	0.6300	0.6300	0.7000	0.7700	99.7403	(77)						
Northwest	10.0000	11.2829	0.6300	0.6300	0.7000	0.7700	34.4821	(81)						
Solar gains	134.2224	240.0839	358.9161	495.7076	601.7780	617.8995	587.2010	504.9377	405.7941	273.5467	162.8533	113.5167	113.5167	(83)
Total gains	543.3991	647.7981	752.2811	865.3438	946.1269	938.8515	893.5777	815.4789	729.0759	620.7047	537.4872	509.9056	509.9056	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)														
Utilisation factor for gains for living area, nil,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	58.8634	59.0094	59.1531	59.8378	59.9677	60.5798	60.5798	60.6945	60.3425	59.9677	59.7056	59.4339	59.4339	(85)
alpha	4.9242	4.9340	4.9435	4.9892	4.9978	5.0387	5.0387	5.0463	5.0228	4.9978	4.9804	4.9623	4.9623	
util living area	0.9992	0.9979	0.9934	0.9750	0.9121	0.7665	0.5993	0.6692	0.9000	0.9880	0.9982	0.9994	0.9994	(86)
MIT	19.6198	19.7773	20.0423	20.4012	20.7243	20.9241	20.9826	20.9706	20.8134	20.3923	19.9413	19.5954	19.5954	(87)
Th 2	19.9362	19.9386	19.9409	19.9517	19.9537	19.9632	19.9632	19.9649	19.9595	19.9537	19.9496	19.9453	19.9453	(88)
util rest of house	0.9989	0.9971	0.9909	0.9646	0.8747	0.6766	0.4696	0.5387	0.8419	0.9814	0.9975	0.9992	0.9992	(89)
MIT 2	18.6731	18.8322	19.0978	19.4593	19.7615	19.9270	19.9586	19.9562	19.8492	19.4562	19.0051	18.6560	18.6560	(90)
Living area fraction	fLA = Living area / (4) =													
MIT	18.8517	19.0105	19.2760	19.6370	19.9431	20.1151	20.1518	20.1475	20.0311	19.6328	19.1817	18.8332	18.8332	(92)
Temperature adjustment	0.0000													
adjusted MIT	18.8517	19.0105	19.2760	19.6370	19.9431	20.1151	20.1518	20.1475	20.0311	19.6328	19.1817	18.8332	18.8332	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9985	0.9961	0.9888	0.9606	0.8742	0.6912	0.4943	0.5634	0.8468	0.9786	0.9966	0.9989	0.9989	(94)
Useful gains	542.5670	645.3034	743.8396	831.2553	827.1158	648.9118	441.7032	459.4465	617.3655	607.4035	535.6807	509.3387	509.3387	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000	(96)
Heat loss rate W	1892.1940	1830.2875	1653.1560	1373.4241	1052.1331	696.8267	448.7625	472.5988	752.3330	1152.9264	1548.8517	1884.5274	1884.5274	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1004.1225	796.3093	676.5314	390.3616	167.4129	0.0000	0.0000	0.0000	0.0000	405.8691	729.4831	1023.1404	1023.1404	(98)
Space heating	5193.2303													
Space heating per m2	(98) / (4) = 47.1170													

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	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1187.6767	934.9795	958.4343	0.0000	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8414	0.9083	0.8748	0.0000	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	999.2982	849.2506	838.4308	0.0000	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1207.9763	1152.6522	1063.4624	0.0000	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	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	150.2483	225.7308	167.4235	0.0000	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling	543.4026													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.5621	56.4327	41.8559	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											135.8507 (107)	
Space cooling per m2											1.2325 (108)	
Energy for space heating											47.1170 (99)	
Energy for space cooling											1,2325 (108)	
Total											48,3495 (109)	
Target Fabric Energy Efficiency (TFEE)											55.6 (109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Windermere Detached BeamBlock			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 141, Chipping Lane , Longridge , PR3				
SAP Rating	84 B	DER	17.28	TER	18.56
Environmental	85 B	% DER<TER	6.88		
CO₂ Emissions (t/year)	1.58	DFEE	50.58	TFEE	58.84
General Requirements Compliance	Pass	% DFEE<TFEE	14.05		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Detached House, total floor area 100 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.56 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.28 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 50.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.37 (max. 2.00)	1.41 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC COMBI ESP1 35
Combi boiler
Efficiency: 89.6% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage: No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock

Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

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

Based on:

Overshading: Average
Windows facing North East: 5.77 m², No overhang
Windows facing South East: 0.66 m², No overhang
Windows facing South West: 10.76 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Thermal bridging y-value 0.034 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	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 245.0135 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					5 * 10 = 50.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					50.0000 / (5) = 0.2041 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4546 (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) = 0.3864 (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	0.4926	0.4830	0.4733	0.4250	0.4154	0.3671	0.3671	0.3574	0.3864	0.4154	0.4347	0.4540 (22b)
Effective ac	0.6213	0.6166	0.6120	0.5903	0.5863	0.5674	0.5674	0.5639	0.5746	0.5863	0.5945	0.6031 (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)			17.1900	1.3347	22.9439		(27)					
Opening Type 5			1.9700	1.0000	1.9700		(26a)					
150mm B&B			42.8700	0.1400	6.0018		(28a)					
Exposed Timber			13.7100	0.1800	2.4678		(28b)					
50mm Platinium	131.3800	19.1600	112.2200	0.2700	30.2994		(29a)					
Solid To Garage	17.6800		17.6800	0.2500	4.4200		(29a)					
400mm	56.6900		56.6900	0.1100	6.2359		(30)					
Total net area of external elements Aum(A, m ²)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 74.3388		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.4300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0228 (36)					
Total fabric heat loss							(33) + (36) = 83.3616 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 50.2387	Feb 49.8577	Mar 49.4843	Apr 47.7302	May 47.4020	Jun 45.8743	Jul 45.8743	Aug 45.5914	Sep 46.4627	Oct 47.4020	Nov 48.0659	Dec 48.7600 (38)
Heat transfer coeff	133.6003	133.2193	132.8459	131.0918	130.7636	129.2359	129.2359	128.9529	129.8243	130.7636	131.4275	132.1216 (39)
Average = Sum(39)m / 12 =												131.0902 (39)
HLP	Jan 1.3419	Feb 1.3381	Mar 1.3343	Apr 1.3167	May 1.3134	Jun 1.2981	Jul 1.2981	Aug 1.2952	Sep 1.3040	Oct 1.3134	Nov 1.3201	Dec 1.3271 (40)
HLP (average)												1.3167 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.6622 (45)
Energy content (annual)												Total = Sum(45)m = 1560.2691 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	24.2650	21.2223	21.8995	19.0925	18.3197	15.8085	14.6489	16.8099	17.0106	19.8243	21.6397	23.4993 (46)
Total storage loss												

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	(56)
Combi loss	14.1448	12.7648	14.1070	13.6097	14.0298	13.5385	13.9657	14.0073	13.5773	14.0737	13.6590	14.1325	14.1325	14.1325	(61)
Total heat required for water heating calculated for each month	175.9113	154.2469	160.1037	140.8932	136.1614	118.9288	111.6253	126.0731	126.9815	146.2354	157.9238	170.7948	170.7948	170.7948	(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	(63)
Output from w/h	175.9113	154.2469	160.1037	140.8932	136.1614	118.9288	111.6253	126.0731	126.9815	146.2354	157.9238	170.7948	170.7948	170.7948	(64)
Heat gains from water heating, kWh/month	57.3236	50.2340	52.0707	45.7242	44.1162	38.4269	35.9632	40.7637	41.1012	47.4622	51.3828	55.6233	55.6233	55.6233	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4381	20.8175	16.9299	12.8170	9.5809	8.0886	8.7400	11.3606	15.2482	19.3611	22.5972	24.0895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.6145	258.2670	251.5828	237.3530	219.3905	202.5082	191.2298	188.5773	195.2615	209.4913	227.4538	244.3361	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	(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 b)	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	(71)
Water heating gains (Table 5)	77.0478	74.7530	69.9875	63.5058	59.2960	53.3707	48.3377	54.7899	57.0850	63.7933	71.3650	74.7625	(72)
Total internal gains	423.1316	420.8686	405.5314	380.7071	355.2986	330.9987	315.3387	321.7591	334.6259	359.6768	388.4473	410.2194	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	5.7700	11.2829	0.7100	0.7000	0.7700	22.4227	(75)						
Southeast	0.6600	36.7938	0.7100	0.7000	0.7700	8.3639	(77)						
Southwest	10.7600	36.7938	0.7100	0.7000	0.7700	136.3568	(79)						
Solar gains	167.1434	292.1550	419.5222	552.9677	649.6361	658.2514	629.0843	554.9300	465.4150	328.2275	201.5556	142.1623	(83)
Total gains	590.2750	713.0236	825.0536	933.6748	1004.9347	989.2302	944.4231	876.6890	800.0409	687.9044	590.0029	552.3817	(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)	28.8623	28.9449	29.0262	29.4146	29.4884	29.8370	29.8370	29.9025	29.7018	29.4884	29.3395	29.1853	21.0000	(85)
alpha	2.9242	2.9297	2.9351	2.9610	2.9659	2.9891	2.9891	2.9935	2.9801	2.9659	2.9560	2.9457		
util living area	0.9849	0.9731	0.9508	0.9024	0.8141	0.6789	0.5415	0.5906	0.7894	0.9298	0.9758	0.9875	(86)	
MIT	18.7291	19.0008	19.4252	19.9695	20.4481	20.7834	20.9203	20.8949	20.6325	20.0010	19.2678	18.6864	(87)	
Th 2	19.8082	19.8111	19.8140	19.8278	19.8303	19.8423	19.8423	19.8446	19.8377	19.8303	19.8251	19.8197	(88)	
util rest of house	0.9817	0.9676	0.9401	0.8799	0.7685	0.5955	0.4211	0.4717	0.7214	0.9091	0.9698	0.9848	(89)	
MIT 2	16.7994	17.1946	17.8079	18.5877	19.2395	19.6620	19.7987	19.7820	19.4961	18.6488	17.5940	16.7438	(90)	
Living area fraction	17.1397	17.5131	18.0932	18.8314	19.4527	19.8598	19.9966	19.9783	19.6966	18.8873	17.8892	17.0864	(91)	
MIT	16.9897	17.3631	17.9432	18.6814	19.3027	19.7098	19.8466	19.8283	19.5466	18.7373	17.7392	16.9364	(92)	
Temperature adjustment													-0.1500	
adjusted MIT	16.9897	17.3631	17.9432	18.6814	19.3027	19.7098	19.8466	19.8283	19.5466	18.7373	17.7392	16.9364	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9697	0.9502	0.9164	0.8515	0.7438	0.5847	0.4215	0.4698	0.7008	0.8822	0.9534	0.9744	(94)	
Useful gains	572.3981	677.5491	756.0719	794.9927	747.4720	578.4340	398.1016	411.8984	560.6837	606.8389	562.4836	538.2641	(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	1695.3506	1660.3301	1520.1794	1282.2647	994.1504	660.3717	419.5718	442.0866	707.0961	1064.0586	1398.2868	1682.7573	(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	835.4767	660.4288	568.4959	350.8358	183.5287	0.0000	0.0000	0.0000	0.0000	340.1714	601.7783	851.5029	(98)	
Space heating												4397.2186	(98)	
Space heating per m ²													(98) / (4) = 44.1163	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4853.2802 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	835.4767	660.4288	568.4959	350.8358	183.5287	0.0000	0.0000	0.0000	0.0000	340.1714	601.7783	851.5029	(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)	923.1787	729.7556	628.1723	387.6639	202.7941	0.0000	0.0000	0.0000	0.0000	375.8800	664.9484	940.8872	(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	175.9113	154.2469	160.1037	140.8932	136.1614	118.9288	111.6253	126.0731	126.9815	146.2354	157.9238	170.7948	(64)
Efficiency of water heater (217)m	89.9267	89.8762	89.7769	89.5594	89.1088	87.3000	87.3000	87.3000	87.3000	89.5135	89.8156	87.3000	(216)
Fuel for water heating, kWh/month	195.6164	171.6214	178.3352	157.3182	152.8035	136.2300	127.8641	144.4136	145.4542	163.3668	175.8311	189.8793	(219)
Water heating fuel used													1938.7337 (219)
Annual totals kWh/year													
Space heating fuel - main system													4853.2802 (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)													413.9241 (232)
Total delivered energy for all uses													7280.9380 (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	4853.2802	0.2160	1048.3085 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1938.7337	0.2160	418.7665 (264)
Space and water heating			1467.0750 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.9241	0.5190	214.8266 (268)
Total CO2, kg/year			1720.8266 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2800 (273)

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

DER			17.2800 ZC1
Total Floor Area		TFA	99.5600
Assumed number of occupants		N	2.7354
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.2141 ZC2
CO2 emissions from cooking, equation (L16)			1.8547 ZC3
Total CO2 emissions			34.3488 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			34.3488 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	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 245.0135 (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) =	0.1224 (8)							
Pressure test				Yes	5.0000							
Measured/design AP50					0.3724 (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) =		0.3166 (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	0.4036	0.3957	0.3978	0.3482	0.3403	0.3007	0.3007	0.2928	0.3166	0.3403	0.3561	0.3720 (22b)
Effective ac	0.5815	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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 Semi-glazed door			1.9700	1.2000	2.3640		(26a)					
TER Opening Type (Uw = 1.40)			17.1900	1.3258	22.7898		(27)					
150mm B&B			42.8700	0.1300	5.5731		(28a)					
Exposed Timber			13.7100	0.1300	1.7823		(28b)					
50mm Platinum	131.3800	19.1600	112.2200	0.1800	20.1996		(29a)					
Solid To Garage	17.6800		17.6800	0.1800	3.1824		(29a)					
400mm	56.6900		56.6900	0.1300	7.3697		(30)					
Total net area of external elements Aum(A, m ²)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 63.2609		(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)							16.4248 (36)					
Total fabric heat loss						(33) + (36) =	79.6857 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.0137	Feb 46.7579	Mar 46.5072	Apr 45.3297	May 45.1094	Jun 44.0838	Jul 44.0838	Aug 43.8939	Sep 44.4789	Oct 45.1094	Nov 45.5551	Dec 46.0210 (38)
Heat transfer coeff	126.6993	126.4436	126.1929	125.0154	124.7951	123.7695	123.7695	123.5796	124.1645	124.7951	125.2407	125.7067 (39)
Average = Sum(39)m / 12 =												125.0143 (39)
HLP	Jan 1.2726	Feb 1.2700	Mar 1.2675	Apr 1.2557	May 1.2535	Jun 1.2432	Jul 1.2432	Aug 1.2413	Sep 1.2471	Oct 1.2535	Nov 1.2579	Dec 1.2626 (40)
HLP (average)												1.2557 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.8622 (45)
Energy content (annual)												Total = Sum(45)m = 1560.2691 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.2650	21.2223	21.8995	19.0925	18.3197	15.8085	14.6489	16.8099	17.0106	19.8243	21.6397	23.4993	(46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

IF cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	47.9258	47.5019	44.0135	45.4806	47.5019	47.9258	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Solar input	212.7254	187.5094	196.9557	175.2093	169.6335	149.4037	143.1401	159.5677	161.3300	183.1206	193.5799	207.6211	207.6211	207.6211	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	212.7254	187.5094	196.9557	175.2093	169.6335	149.4037	143.1401	159.5677	161.3300	183.1206	193.5799	207.6211	207.6211	207.6211	(64)
	66.5271	58.5496	61.2837	54.3032	52.4842	46.0456	43.8420	49.1374	49.6883	56.6835	60.2968	64.8299	64.8299	64.8299	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4381	20.8175	16.9299	12.8170	9.5809	8.0886	8.7400	11.3606	15.2482	19.3611	22.5972	24.0895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.6145	258.2670	251.5828	237.3530	219.3905	202.5082	191.2298	188.5773	195.2615	209.4913	227.4538	244.3361	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	(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 b)	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	(71)
Water heating gains (Table 5)	89.4181	87.1274	82.3705	75.4211	70.5433	63.9523	58.9274	66.0448	69.0116	76.1875	83.7456	87.1370	(72)
Total internal gains	435.5019	433.2431	417.9145	392.6224	366.5459	341.5803	325.9284	333.0140	346.5525	372.0710	400.8278	422.5938	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	5.7700	11.2829	0.6300	0.7000	0.7700	19.8962	(75)						
Southeast	0.6600	36.7938	0.6300	0.7000	0.7700	7.4215	(77)						
Southwest	10.7600	36.7938	0.6300	0.7000	0.7700	120.9927	(79)						
Solar gains	148.3104	259.2361	372.2521	490.6614	576.4377	584.0823	558.2016	492.4026	412.9739	291.2441	178.8451	126.1440	(83)
Total gains	583.8123	692.4792	790.1666	883.2839	942.9836	925.6626	884.1300	825.4166	759.5264	663.3152	579.6730	548.7378	(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)	0.9982	0.9956	0.9885	0.9649	0.8980	0.7555	0.5904	0.6470	0.8707	0.9786	0.9961	0.9986	(86)
MIT	19.5854	19.7572	20.0314	20.3888	20.7094	20.9139	20.9790	20.9681	20.8188	20.3993	19.9237	19.5544	(87)
Th 2	19.8624	19.8644	19.8664	19.8757	19.8775	19.8856	19.8856	19.8871	19.8825	19.8775	19.8739	19.8702	(88)
util rest of house	0.9975	0.9940	0.9842	0.9508	0.8553	0.6601	0.4535	0.5103	0.8010	0.9674	0.9945	0.9981	(89)
MIT 2	17.9847	18.2368	18.6367	19.1541	19.5873	19.8270	19.8779	19.8739	19.7336	19.1776	18.4873	17.9449	(90)
Living area fraction	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(91)
MIT	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(92)
Temperature adjustment	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(93)
adjusted MIT	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	581.5236	686.4048	773.4453	832.4166	802.5168	622.7841	422.3124	440.7664	610.7867	637.1172	574.9879	547.1085	(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	1769.6113	1720.2569	1562.6080	1309.1484	1008.9916	670.6724	429.7440	453.1501	723.2643	1097.3316	1457.8845	1763.5096	(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	883.9373	694.7487	587.1370	343.2469	153.6173	0.0000	0.0000	0.0000	0.0000	342.3995	635.6855	905.0024	(98)	
Space heating												4545.7745	(98)	
Space heating per m ²												(98) / (4) =	45.6586	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

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													4866.9963 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	883.9373	694.7487	587.1370	343.2469	153.6173	0.0000	0.0000	0.0000	0.0000	342.3995	635.6855	905.0024	(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)	946.3996	743.8422	628.6264	367.5021	164.4724	0.0000	0.0000	0.0000	0.0000	366.5947	680.6055	968.9533	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	212.7254	187.5094	196.9557	175.2093	169.6335	149.4037	143.1401	159.5677	161.3300	183.1206	193.5799	207.6211	(64)
Efficiency of water heater (217)m	88.2470	88.0463	87.6314	86.7141	84.8026	80.3000	80.3000	80.3000	80.3000	86.6043	87.8215	80.3000	(216)
Fuel for water heating, kWh/month	241.0569	212.9668	224.7548	202.0539	200.0334	186.0569	178.2567	198.7145	200.9091	211.4452	220.4243	235.0599	(219)
Water heating fuel used													2511.7325 (219)
Annual totals kWh/year													
Space heating fuel - main system													4866.9963 (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)													413.9241 (232)
Total delivered energy for all uses													7867.6529 (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	4866.9963	0.2160	1051.2712 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2511.7325	0.2160	542.5342 (264)
Space and water heating			1593.8054 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.9241	0.5190	214.8266 (268)
Total CO2, kg/m2/year			1847.5570 (272)
Emissions per m2 for space and water heating			16.0085 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1578 (272b)
Emissions per m2 for pumps and fans			0.3910 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0085 * 1.00) + 2.1578 + 0.3910, rounded to 2 d.p.			18.5600 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 245.0135 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					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) = 0.1224 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.3729 (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) = 0.3170 (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	0.4042	0.3963	0.3883	0.3487	0.3408	0.3012	0.3012	0.2932	0.3170	0.3408	0.3566	0.3725 (22b)
Effective ac	0.5817	0.5785	0.5754	0.5608	0.5581	0.5453	0.5453	0.5430	0.5502	0.5581	0.5636	0.5694 (25)

3. Heat losses and heat loss parameter:

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1 (Uw = 1.41)			17.1900	1.3347	22.9439		(27)					
Opening Type 5			1.9700	1.0000	1.9700		(26a)					
150mm B&B			42.8700	0.1400	6.0018		(28a)					
Exposed Timber			13.7100	0.1800	2.4678		(28b)					
50mm Platinum	131.3800	19.1600	112.2200	0.2700	30.2994		(29a)					
Solid To Garage	17.6800		17.6800	0.2500	4.4200		(29a)					
400mm	56.6900		56.6900	0.1100	6.2359		(30)					
Total net area of external elements Aum(A, m2)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 74.3388		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							139.4300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0228 (36)					
Total fabric heat loss							(33) + (36) = 83.3616 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.0314	Feb 46.7749	Mar 46.5235	Apr 45.3429	May 45.1220	Jun 44.0936	Jul 44.0936	Aug 43.9032	Sep 44.4897	Oct 45.1220	Nov 45.5608	Dec 46.0360 (38)
Heat transfer coeff	130.3929	130.1365	129.8851	128.7045	128.4836	127.4552	127.4552	127.2648	127.8513	128.4836	128.9304	129.3976 (39)
Average = Sum(39)m / 12 =												128.7034 (39)
HLP	Jan 1.3097	Feb 1.3071	Mar 1.3046	Apr 1.2927	May 1.2905	Jun 1.2802	Jul 1.2802	Aug 1.2783	Sep 1.2842	Oct 1.2905	Nov 1.2950	Dec 1.2997 (40)
HLP (average)												1.2927 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.8622 (45)
Energy content (annual)												Total = Sum(45)m = 1560.2691 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	230.1272	296.5576	244.3267	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												771.0116 (104)
Intermittency factor (Table 10b)												1.0000 (105)
									FC = cooled area / (4) =			
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	57.5318	74.1394	61.0817	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												192.7529 (107)
Energy for space heating												1.9360 (108)
Energy for space cooling												48.6416 (99)
Total												1.9360 (108)
Dwelling Fabric Energy Efficiency (DFEE)												50.5777 (109)
												50.6 (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	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.0135 (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) = 0.1224 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3724 (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) = 0.3166 (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	0.4036	0.3957	0.3978	0.3482	0.3403	0.3007	0.3007	0.2928	0.3166	0.3403	0.3561	0.3720 (22b)
Effective ac	0.5815	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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 Semi-glazed door			1.9700	1.2000	2.3640		(26a)					
TER Opening Type (Uw = 1.40)			17.1900	1.3258	22.7898		(27)					
150mm B&B			42.8700	0.1300	5.5731		(28a)					
Exposed Timber			13.7100	0.1300	1.7823		(28b)					
50mm Platinum	131.3800	19.1600	112.2200	0.1800	20.1996		(29a)					
Solid To Garage	17.6800		17.6800	0.1800	3.1824		(29a)					
400mm	56.6900		56.6900	0.1300	7.3697		(30)					
Total net area of external elements Aum(A, m ²)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 63.2609		(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)							16.4248 (36)					
Total fabric heat loss							(33) + (36) = 79.6857 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.0137	Feb 46.7579	Mar 46.5072	Apr 45.3297	May 45.1094	Jun 44.0838	Jul 44.0838	Aug 43.8939	Sep 44.4789	Oct 45.1094	Nov 45.5551	Dec 46.0210 (38)
Heat transfer coeff	126.6993	126.4436	126.1929	125.0154	124.7951	123.7695	123.7695	123.5796	124.1645	124.7951	125.2407	125.7067 (39)
Average = Sum(39)m / 12 =												125.0143 (39)
HLP	Jan 1.2726	Feb 1.2700	Mar 1.2675	Apr 1.2557	May 1.2535	Jun 1.2432	Jul 1.2432	Aug 1.2413	Sep 1.2471	Oct 1.2535	Nov 1.2579	Dec 1.2626 (40)
HLP (average)												1.2557 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.8622 (45)
Energy content (annual)												Total = Sum(45)m = 1560.2691 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	138.6972	208.9315	162.6362	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												510.2649 (104)
Intermittency factor (Table 10b)												1.0000 (105)
												FC = cooled area / (4) =
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	34.6743	52.2329	40.6591	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												127.5662 (107)
Energy for space heating												1.2813 (108)
Energy for space cooling												49.8867 (99)
Total												1.2813 (108)
Target Fabric Energy Efficiency (TFEE)												51.1680 (109)
												58.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	Windermere Detached			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	52 PRIMROSE ROAD, LONGRIDGE, PRESTON, PR3 2RG				
SAP Rating	84 B	DER	17.31	TER	18.56
Environmental	85 B	% DER<TER	6.72		
CO₂ Emissions (t/year)	1.59	DFEE	50.89	TFEE	58.84
General Requirements Compliance	Pass	% DFEE<TFEE	13.51		
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

Detached House, total floor area 100 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.56 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.31 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 50.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.16 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.37 (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: 3.90 (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 North East: 5.77 m², No overhang
Windows facing South East: 0.66 m², No overhang
Windows facing South West: 10.76 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.9 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	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 245.0135 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					5 * 10 = 50.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.2041 (8)							
Pressure test					Yes							
Measured/design AP50					3.9000							
Infiltration rate					0.3991 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3392 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4325	0.4240	0.4155	0.3731	0.3647	0.3222	0.3222	0.3138	0.3392	0.3647	0.3816	0.3986 (22b)
Effective ac	0.5935	0.5899	0.5863	0.5696	0.5665	0.5519	0.5519	0.5492	0.5575	0.5665	0.5728	0.5794 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Opening Type 1 (Uw = 1.41)			17.1900	1.3347	22.9439		(27)					
Opening Type 5			1.9700	1.0000	1.9700		(26a)					
150mm Platinum			42.8700	0.1600	6.8592		(28a)					
Exposed Timber			13.7100	0.1800	2.4678		(28b)					
50mm Platinum	131.3800	19.1600	112.2200	0.2700	30.2994		(29a)					
Solid To Garage	17.6800		17.6800	0.2500	4.4200		(29a)					
400mm	56.6900		56.6900	0.1100	6.2359		(30)					
Total net area of external elements Aum(A, m ²)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 75.1962		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.4300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3754 (36)					
Total fabric heat loss						(33) + (36) =	85.5715 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.9991	Feb 47.6955	Mar 47.4077	Apr 46.0558	May 45.8028	Jun 44.6254	Jul 44.6254	Aug 44.4073	Sep 45.0789	Oct 45.8028	Nov 46.3145	Dec 46.8495 (38)
Heat transfer coeff	133.5607	133.2670	132.9792	131.6273	131.3744	130.1969	130.1969	129.9789	130.6505	131.3744	131.8861	132.4210 (39)
Average = Sum(39)m / 12 =												131.6261 (39)
HLP	Jan 1.3415	Feb 1.3386	Mar 1.3357	Apr 1.3221	May 1.3195	Jun 1.3077	Jul 1.3077	Aug 1.3055	Sep 1.3123	Oct 1.3195	Nov 1.3247	Dec 1.3301 (40)
HLP (average)												1.3221 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.8622 (45)
Energy content (annual)												Total = Sum(45)m = 1560.2691 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	24.2650	21.2223	21.8995	19.0925	18.3197	15.8085	14.6489	16.8099	17.0106	19.8243	21.6397	23.4993 (46)
Total storage loss												

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	(56)
Combi loss	14.1448	12.7648	14.1070	13.6097	14.0298	13.5385	13.9657	14.0073	13.5773	14.0737	13.6590	14.1325	14.1325	14.1325	(61)
Total heat required for water heating calculated for each month	175.9113	154.2469	160.1037	140.8932	136.1614	118.9288	111.6253	126.0731	126.9815	146.2354	157.9238	170.7948	170.7948	170.7948	(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	(63)
Output from w/h	175.9113	154.2469	160.1037	140.8932	136.1614	118.9288	111.6253	126.0731	126.9815	146.2354	157.9238	170.7948	170.7948	170.7948	(64)
Heat gains from water heating, kWh/month	57.3236	50.2340	52.0707	45.7242	44.1162	38.4269	35.9632	40.7637	41.1012	47.4622	51.3828	55.6233	55.6233	55.6233	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4381	20.8175	16.9299	12.8170	9.5809	8.0886	8.7400	11.3606	15.2482	19.3611	22.5972	24.0895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.6145	258.2670	251.5828	237.3530	219.3905	202.5082	191.2298	188.5773	195.2615	209.4913	227.4538	244.3361	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	(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 b)	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	(71)
Water heating gains (Table 5)	77.0478	74.7530	69.9875	63.5058	59.2960	53.3707	48.3377	54.7899	57.0850	63.7933	71.3650	74.7625	(72)
Total internal gains	423.1316	420.8686	405.5314	380.7071	355.2986	330.9987	315.3387	321.7591	334.6259	359.6768	388.4473	410.2194	(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 Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	5.7700	11.2829	0.7100	0.7000	0.7700	22.4227	(75)						
Southeast	0.6600	36.7938	0.7100	0.7000	0.7700	8.3639	(77)						
Southwest	10.7600	36.7938	0.7100	0.7000	0.7700	136.3568	(79)						
Solar gains	167.1434	292.1550	419.5222	552.9677	649.6361	658.2514	629.0843	554.9300	465.4150	328.2275	201.5556	142.1623	(83)
Total gains	590.2750	713.0236	825.0536	933.6748	1004.9347	989.2502	944.4231	876.6890	800.0409	687.9044	590.0029	552.3817	(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)	28.8709	28.9345	28.9971	29.2949	29.3513	29.6168	29.6168	29.6665	29.5140	29.3513	29.2375	29.1194	21.0000	(85)
alpha	2.9247	2.9290	2.9331	2.9530	2.9568	2.9745	2.9745	2.9778	2.9676	2.9568	2.9492	2.9413		
util living area	0.9849	0.9731	0.9508	0.9027	0.8150	0.6811	0.5441	0.5933	0.7907	0.9301	0.9758	0.9875	(86)	
MIT	18.7298	19.0000	19.4231	19.9624	20.4423	20.7784	20.9180	20.8919	20.6269	19.9941	19.2611	18.6813	(87)	
Th 2	19.8085	19.8108	19.8130	19.8236	19.8256	19.8348	19.8348	19.8365	19.8312	19.8256	19.8215	19.8174	(88)	
util rest of house	0.9817	0.9676	0.9402	0.8803	0.7694	0.5974	0.4226	0.4735	0.7227	0.9093	0.9698	0.9848	(89)	
MIT 2	16.8005	17.1932	17.8044	18.5753	19.2286	19.6505	19.7900	19.7722	19.4845	18.6361	17.5823	16.7351	(90)	
Living area fraction	17.1408	17.5119	18.0899	18.8199	19.4427	19.8494	19.9890	19.9697	19.6860	18.8756	17.8784	17.0784	(91)	
MIT	16.9908	17.3619	17.9399	18.6699	19.2927	19.6994	19.8390	19.8197	19.5360	18.7256	17.7284	16.9284	(92)	
Temperature adjustment													-0.1500	
adjusted MIT	16.9908	17.3619	17.9399	18.6699	19.2927	19.6994	19.8390	19.8197	19.5360	18.7256	17.7284	16.9284	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9697	0.9502	0.9164	0.8517	0.7445	0.5864	0.4231	0.4716	0.7018	0.8823	0.9533	0.9744	(94)
Useful gains	572.3997	677.5487	756.0872	795.2477	748.1551	580.0566	399.5928	413.4101	561.5077	606.9661	562.4766	538.2516	(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	1694.9898	1660.7558	1521.2650	1285.9902	997.4860	663.9276	421.7013	444.4888	710.2211	1067.5020	1401.7417	1685.5017	(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	835.2071	660.7152	569.2923	353.3346	185.5022	0.0000	0.0000	0.0000	0.0000	342.6387	604.2709	853.5540	(98)
Space heating												4404.5150	(98)
Space heating per m2												44.2398	(98) / (4) = (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													4866.8674 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	835.2071	660.7152	569.2923	353.3346	185.5022	0.0000	0.0000	0.0000	0.0000	342.6387	604.2709	853.5540	(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)	922.8808	730.0720	629.0522	390.4250	204.9748	0.0000	0.0000	0.0000	0.0000	378.6063	667.7027	943.1536	(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	175.9113	154.2469	160.1037	140.8932	136.1614	118.9288	111.6253	126.0731	126.9815	146.2354	157.9238	170.7948	(64)
Efficiency of water heater (217)m	89.9265	89.8765	89.7777	89.5641	89.1172	87.3000	87.3000	87.3000	87.3000	89.5185	89.8178	87.3000	(216)
Fuel for water heating, kWh/month	195.6167	171.6210	178.3336	157.3099	152.7891	136.2300	127.8641	144.4136	145.4542	163.3578	175.8268	189.8769	(219)
Water heating fuel used													1938.6938 (219)
Annual totals kWh/year													
Space heating fuel - main system													4866.8674 (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)													413.9241 (232)
Total delivered energy for all uses													7294.4852 (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	4866.8674	0.2160	1051.2433 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1938.6938	0.2160	418.7579 (264)
Space and water heating			1470.0012 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.9241	0.5190	214.8266 (268)
Total CO2, kg/year			1723.7528 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3100 (273)

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

DER			17.3100 ZC1
Total Floor Area		TFA	99.5600
Assumed number of occupants		N	2.7354
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.2141 ZC2
CO2 emissions from cooking, equation (L16)			1.8547 ZC3
Total CO2 emissions			34.3788 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			34.3788 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	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 245.0135 (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) = 0.1224 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3724 (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) = 0.3166 (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	0.4036	0.3957	0.3978	0.3482	0.3403	0.3007	0.3007	0.2928	0.3166	0.3403	0.3561	0.3720 (22b)
Effective ac	0.5815	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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 Semi-glazed door			1.9700	1.2000	2.3640		(26a)					
TER Opening Type (Uw = 1.40)			17.1900	1.3258	22.7898		(27)					
150mm Platinum			42.8700	0.1300	5.5731		(28a)					
Exposed Timber			13.7100	0.1300	1.7823		(28b)					
50mm Platinum	131.3800	19.1600	112.2200	0.1800	20.1996		(29a)					
Solid To Garage	17.6800		17.6800	0.1800	3.1824		(29a)					
400mm	56.6900		56.6900	0.1300	7.3697		(30)					
Total net area of external elements Aum(A, m ²)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 63.2609		(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)							16.4248 (36)					
Total fabric heat loss							(33) + (36) = 79.6857 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.0137	Feb 46.7579	Mar 46.5072	Apr 45.3297	May 45.1094	Jun 44.0838	Jul 44.0838	Aug 43.8939	Sep 44.4789	Oct 45.1094	Nov 45.5551	Dec 46.0210 (38)
Heat transfer coeff	126.6993	126.4436	126.1929	125.0154	124.7951	123.7695	123.7695	123.5796	124.1645	124.7951	125.2407	125.7067 (39)
Average = Sum(39)m / 12 =												125.0143 (39)
HLP	Jan 1.2726	Feb 1.2700	Mar 1.2675	Apr 1.2557	May 1.2535	Jun 1.2432	Jul 1.2432	Aug 1.2413	Sep 1.2471	Oct 1.2535	Nov 1.2579	Dec 1.2626 (40)
HLP (average)												1.2557 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.8622 (45)
Energy content (annual)												Total = Sum(45)m = 1560.2691 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.2650	21.2223	21.8995	19.0925	18.3197	15.8085	14.6489	16.8099	17.0106	19.8243	21.6397	23.4993	(46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

IF cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	47.9258	47.5019	44.0135	45.4806	47.5019	47.9258	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Solar input	212.7254	187.5094	196.9557	175.2093	169.6335	149.4037	143.1401	159.5677	161.3300	183.1206	193.5799	207.6211	207.6211	207.6211	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	Solar input (sum of months) = Sum(63)m =												0.0000	(63)	
	212.7254	187.5094	196.9557	175.2093	169.6335	149.4037	143.1401	159.5677	161.3300	183.1206	193.5799	207.6211	207.6211	207.6211	(64)
	Total per year (kWh/year) = Sum(64)m =												2139.7965	(64)	
	66.5271	58.5496	61.2837	54.3032	52.4842	46.0456	43.8420	49.1374	49.6883	56.6835	60.2968	64.8299	64.8299	64.8299	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4381	20.8175	16.9299	12.8170	9.5809	8.0886	8.7400	11.3606	15.2482	19.3611	22.5972	24.0895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.6145	258.2670	251.5828	237.3530	219.3905	202.5082	191.2298	188.5773	195.2615	209.4913	227.4538	244.3361	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	(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 b)	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	(71)
Water heating gains (Table 5)	89.4181	87.1274	82.3705	75.4211	70.5433	63.9523	58.9274	66.0448	69.0116	76.1875	83.7456	87.1370	(72)
Total internal gains	435.5019	433.2431	417.9145	392.6224	366.5459	341.5803	325.9284	333.0140	346.5525	372.0710	400.8278	422.5938	(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 Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	5.7700	11.2829	0.6300	0.7000	0.7700	19.8962	(75)						
Southeast	0.6600	36.7938	0.6300	0.7000	0.7700	7.4215	(77)						
Southwest	10.7600	36.7938	0.6300	0.7000	0.7700	120.9927	(79)						
Solar gains	148.3104	259.2361	372.2521	490.6614	576.4377	584.0823	558.2016	492.4026	412.9739	291.2441	178.8451	126.1440	(83)
Total gains	583.8123	692.4792	790.1666	883.2839	942.9836	925.6626	884.1300	825.4166	759.5264	663.3152	579.6730	548.7378	(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)	0.9982	0.9956	0.9885	0.9649	0.8980	0.7555	0.5904	0.6470	0.8707	0.9786	0.9961	0.9986	(86)
MIT	19.5854	19.7572	20.0314	20.3888	20.7094	20.9139	20.9790	20.9681	20.8188	20.3993	19.9237	19.5544	(87)
Th 2	19.8624	19.8644	19.8664	19.8757	19.8775	19.8856	19.8856	19.8871	19.8825	19.8775	19.8739	19.8702	(88)
util rest of house	0.9975	0.9940	0.9842	0.9508	0.8553	0.6601	0.4535	0.5103	0.8010	0.9674	0.9945	0.9981	(89)
MIT 2	17.9847	18.2368	18.6367	19.1541	19.5873	19.8270	19.8779	19.8739	19.7336	19.1776	18.4873	17.9449	(90)
Living area fraction	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(91)
MIT	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(92)
Temperature adjustment	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(93)
adjusted MIT	18.2670	18.5049	18.8827	19.3719	19.7852	20.0187	20.0721	20.0669	19.9250	19.3931	18.7407	18.2288	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Useful gains	581.5236	686.4048	773.4453	832.4166	802.5168	622.7841	422.3124	440.7664	610.7867	637.1172	574.9879	547.1085	(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	1769.6113	1720.2569	1562.6080	1309.1484	1008.9916	670.6724	429.7440	453.1501	723.2643	1097.3316	1457.8845	1763.5096	(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	883.9373	694.7487	587.1370	343.2469	153.6173	0.0000	0.0000	0.0000	0.0000	342.3995	635.6855	905.0024	(98)		
Space heating	Space heating per m2												4545.7745	(98)	
													(98) / (4) =	45.6586	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4866.9963 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	883.9373	694.7487	587.1370	343.2469	153.6173	0.0000	0.0000	0.0000	0.0000	342.3995	635.6855	905.0024	(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)	946.3996	743.8422	628.6264	367.5021	164.4724	0.0000	0.0000	0.0000	0.0000	366.5947	680.6055	968.9533	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	212.7254	187.5094	196.9557	175.2093	169.6335	149.4037	143.1401	159.5677	161.3300	183.1206	193.5799	207.6211	(64)
Efficiency of water heater (217)m	88.2470	88.0463	87.6314	86.7141	84.8026	80.3000	80.3000	80.3000	80.3000	86.6043	87.8215	80.3000	(216)
Fuel for water heating, kWh/month	241.0569	212.9668	224.7548	202.0539	200.0334	186.0569	178.2567	198.7145	200.9091	211.4452	220.4243	235.0599	(219)
Water heating fuel used													2511.7325 (219)
Annual totals kWh/year													
Space heating fuel - main system													4866.9963 (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)													413.9241 (232)
Total delivered energy for all uses													7867.6529 (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	4866.9963	0.2160	1051.2712 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2511.7325	0.2160	542.5342 (264)
Space and water heating			1593.8054 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.9241	0.5190	214.8266 (268)
Total CO2, kg/m2/year			1847.5570 (272)
Emissions per m2 for space and water heating			16.0085 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1578 (272b)
Emissions per m2 for pumps and fans			0.3910 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0085 * 1.00) + 2.1578 + 0.3910, rounded to 2 d.p.			18.5600 (273)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 245.0135 (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) = 0.1224 (8)							
Pressure test					Yes							
Measured/design AP50					3.9000							
Infiltration rate					0.3174 (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) = 0.2698 (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	0.3440	0.3373	0.3305	0.2968	0.2901	0.2563	0.2563	0.2496	0.2698	0.2901	0.3036	0.3170 (22b)
Effective ac	0.5592	0.5569	0.5546	0.5440	0.5421	0.5329	0.5329	0.5311	0.5364	0.5421	0.5461	0.5503 (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)			17.1900	1.3347	22.9439		(27)					
Opening Type 5			1.9700	1.0000	1.9700		(26a)					
150mm Platinum			42.8700	0.1600	6.8592		(28a)					
Exposed Timber			13.7100	0.1800	2.4678		(28b)					
50mm Platinum	131.3800	19.1600	112.2200	0.2700	30.2994		(29a)					
Solid To Garage	17.6800		17.6800	0.2500	4.4200		(29a)					
400mm	56.6900		56.6900	0.1100	6.2359		(30)					
Total net area of external elements Aum(A, m ²)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 75.1962		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.4300 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3754 (36)					
Total fabric heat loss						(33) + (36) =	85.5715 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.2120	Feb 45.0262	Mar 44.8441	Apr 43.9887	May 43.8286	Jun 43.0836	Jul 43.0836	Aug 42.9456	Sep 43.3706	Oct 43.8286	Nov 44.1524	Dec 44.4909 (38)
Heat transfer coeff	130.7835	130.5978	130.4156	129.5602	129.4002	128.6551	128.6551	128.5172	128.9421	129.4002	129.7239	130.0624 (39)
Average = Sum(39)m / 12 =												129.5595 (39)
HLP	Jan 1.3136	Feb 1.3117	Mar 1.3099	Apr 1.3013	May 1.2997	Jun 1.2922	Jul 1.2922	Aug 1.2909	Sep 1.2951	Oct 1.2997	Nov 1.3030	Dec 1.3064 (40)
HLP (average)												1.3013 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.6622 (45)
Energy content (annual)										Total = Sum(45)m =		1560.2691 (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												

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Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	227.9881	294.0125	242.0328	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												764.0334 (104)
Intermittency factor (Table 10b)												1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	56.9970	73.5031	60.5082	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												191.0083 (107)
Energy for space heating												1.9185 (108)
Energy for space cooling												48.9726 (99)
Total												1.9185 (108)
Dwelling Fabric Energy Efficiency (DFEE)												50.8912 (109)
												50.9 (109)

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Calculation Type: New Build (As Built)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.8700 (1b)	x 2.3300 (2b)	= 99.8871 (1b) - (3b)
First floor	56.6900 (1c)	x 2.5600 (2c)	= 145.1264 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.5600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 245.0135 (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) =	0.1224 (8)							
Pressure test				Yes	5.0000							
Measured/design AP50					0.3724 (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) =	0.3166 (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	0.4036	0.3957	0.3978	0.3482	0.3403	0.3007	0.3007	0.2928	0.3166	0.3403	0.3561	0.3720 (22b)
Effective ac	0.5815	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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 Semi-glazed door			1.9700	1.2000	2.3640		(26a)					
TER Opening Type (Uw = 1.40)			17.1900	1.3258	22.7898		(27)					
150mm Platinum			42.8700	0.1300	5.5731		(28a)					
Exposed Timber			13.7100	0.1300	1.7823		(28b)					
50mm Platinum	131.3800	19.1600	112.2200	0.1800	20.1996		(29a)					
Solid To Garage	17.6800		17.6800	0.1800	3.1824		(29a)					
400mm	56.6900		56.6900	0.1300	7.3697		(30)					
Total net area of external elements Aum(A, m ²)			262.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	63.2609	(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)							16.4248 (36)					
Total fabric heat loss						(33) + (36) =	79.6857 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.0137	Feb 46.7579	Mar 46.5072	Apr 45.3297	May 45.1094	Jun 44.0838	Jul 44.0838	Aug 43.8939	Sep 44.4789	Oct 45.1094	Nov 45.5551	Dec 46.0210 (38)
Heat transfer coeff	126.6993	126.4436	126.1929	125.0154	124.7951	123.7695	123.7695	123.5796	124.1645	124.7951	125.2407	125.7067 (39)
Average = Sum(39)m / 12 =												125.0143 (39)
HLP	Jan 1.2726	Feb 1.2700	Mar 1.2675	Apr 1.2557	May 1.2535	Jun 1.2432	Jul 1.2432	Aug 1.2413	Sep 1.2471	Oct 1.2535	Nov 1.2579	Dec 1.2626 (40)
HLP (average)												1.2557 (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												2.7354 (42)
Average daily hot water use (litres/day)												99.1661 (43)
Daily hot water use	109.0827	105.1161	101.1494	97.1828	93.2161	89.2495	89.2495	93.2161	97.1828	101.1494	105.1161	109.0827 (44)
Energy conte	161.7665	141.4820	145.9968	127.2835	122.1316	105.3903	97.6596	112.0658	113.4042	132.1617	144.2648	156.8622 (45)
Energy content (annual)												Total = Sum(45)m = 1560.2691 (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												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	34.3754	30.0649	31.0243	27.0478	25.9530	22.3954	20.7527	23.8140	24.0984	28.0844	30.6563	33.2907	(65)				

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	136.7708	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.4381	20.8175	16.9299	12.8170	9.5809	8.0886	8.7400	11.3606	15.2482	19.3611	22.5972	24.0895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.6145	258.2670	251.5828	237.3530	219.3905	202.5082	191.2298	188.5773	195.2615	209.4913	227.4538	244.3361	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	36.6771	(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)	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	-109.4166	(71)
Water heating gains (Table 5)	46.2035	44.7395	41.6994	37.5663	34.8830	31.1048	27.8934	32.0080	33.4700	37.7478	42.5782	44.7456	(72)
Total internal gains	389.2873	387.8552	374.2433	351.7676	327.8856	305.7328	291.8944	295.9772	308.0109	330.6314	356.6604	377.2024	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	5.7700	11.2829	0.6300		0.7000	0.7700	19.8962	(75)					
Southeast	0.6600	36.7938	0.6300		0.7000	0.7700	7.4215	(77)					
Southwest	10.7600	36.7938	0.6300		0.7000	0.7700	120.9927	(79)					
Solar gains	148.3104	259.2361	372.2521	490.6614	576.4377	584.0823	558.2016	492.4026	412.9739	291.2441	178.8451	126.1440	(83)
Total gains	537.5976	647.0913	746.4954	842.4291	904.3233	889.8151	850.0960	788.3798	720.9848	621.8755	535.5056	503.3464	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains for living area, n _l ,m (see Table 9a)													21.0000	(85)
tau	54.5693	54.6796	54.7883	55.3043	55.4019	55.8610	55.8610	55.9469	55.6833	55.4019	55.2048	55.0002		
alpha	4.6380	4.6453	4.6526	4.6870	4.6935	4.7241	4.7241	4.7298	4.7122	4.6935	4.6803	4.6667		
util living area	0.9987	0.9967	0.9908	0.9704	0.9097	0.7741	0.6101	0.6705	0.8879	0.9833	0.9972	0.9991	(86)	
MIT	19.5431	19.7161	19.9932	20.3566	20.6871	20.9042	20.9760	20.9630	20.7992	20.3645	19.8835	19.5127	(87)	
Th 2	19.8624	19.8644	19.8664	19.8757	19.8775	19.8856	19.8856	19.8871	19.8825	19.8775	19.8739	19.8702	(88)	
util rest of house	0.9982	0.9955	0.9873	0.9582	0.8702	0.6802	0.4706	0.5319	0.8232	0.9742	0.9960	0.9987	(89)	
MIT 2	18.5382	18.7123	18.9893	19.3529	19.6612	19.8402	19.8795	19.8764	19.7671	19.3664	18.8873	18.5141	(90)	
Living area fraction										FLA = Living area / (4) =		0.1764	(91)	
MIT	18.7154	18.8894	19.1663	19.5299	19.8422	20.0279	20.0729	20.0680	19.9492	19.5425	19.0630	18.6902	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.7154	18.8894	19.1663	19.5299	19.8422	20.0279	20.0729	20.0680	19.9492	19.5425	19.0630	18.6902	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9976	0.9940	0.9844	0.9533	0.8687	0.6937	0.4955	0.5564	0.8279	0.9705	0.9948	0.9982	(94)	
Useful gains	536.2913	643.2372	734.8209	803.0683	785.6166	617.2564	421.1855	438.6189	596.9240	603.5188	532.7087	502.4447	(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	1826.4257	1768.8673	1598.4012	1328.9001	1016.1049	671.8090	429.8373	453.2942	726.2578	1115.9766	1498.2606	1821.5159	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	959.8600	756.4234	642.5037	378.5989	171.4833	0.0000	0.0000	0.0000	0.0000	381.2686	695.1974	981.3890	(98)	
Space heating												4966.7243	(98)	
Space heating per m2												(98) / (4) =	49.8867	(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	1163.4333	915.8943	939.2048	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8187	0.8905	0.8599	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	952.4921	815.6388	807.6629	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1145.1271	1096.4606	1026.2600	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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	138.6972	208.9315	162.6362	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												510.2649 (104)
Intermittency factor (Table 10b)												1.0000 (105)
												FC = cooled area / (4) =
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	34.6743	52.2329	40.6591	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												127.5662 (107)
Energy for space heating												1.2813 (108)
Energy for space cooling												49.8867 (99)
Total												1.2813 (108)
Target Fabric Energy Efficiency (TFEE)												51.1680 (109)
												58.8 (109)