

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Ellerton Mid-Terrace			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 058, Chipping Lane , Longridge , PR3				
SAP Rating	85 B	DER	15.79	TER	16.91
Environmental	88 B	% DER<TER	6.61		
CO₂ Emissions (t/year)	1.07	DFEE	37.34	TFEE	42.62
General Requirements Compliance	Pass	% DFEE<TFEE	12.37		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

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

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DWELLING AS DESIGNED

Mid-Terrace House, total floor area 77 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.91 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.79 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.41 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 35

Combi boiler

Efficiency: 89.6% SEDBUK2009

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: 4.23 m², No overhang
Windows facing South West: 6.45 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.00 W/m²K

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	38.5600 (1b)	x 2.3300 (2b)	= 89.8448 (1b) - (3b)
First floor	38.5600 (1c)	x 2.5600 (2c)	= 98.7136 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 188.5584 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					4 * 10 = 40.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.2121 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4626 (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) = 0.3932 (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	0.5014	0.4916	0.4817	0.4326	0.4227	0.3736	0.3736	0.3637	0.3932	0.4227	0.4424	0.4621 (22b)
Effective ac	0.6257	0.6208	0.6160	0.5936	0.5894	0.5698	0.5698	0.5662	0.5773	0.5894	0.5979	0.6067 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			10.6800	1.3347	14.2548		(27)					
150mm Platinum			38.5600	0.1200	4.6272		(28a)					
50 mm A. Platinum	45.4100	12.6500	32.7600	0.2700	8.8452		(29a)					
400mm Mineral wool	38.5600		38.5600	0.1100	4.2416		(30)					
Total net area of external elements Aum(A, m2)			122.5300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 33.9388		(33)					
E-WM-22			81.0400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							214.7430 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3776 (36)					
Total fabric heat loss							(33) + (36) = 42.3164 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.9332	Feb 38.6295	Mar 38.3318	Apr 36.9336	May 36.6720	Jun 35.4542	Jul 35.4542	Aug 35.2287	Sep 35.9233	Oct 36.6720	Nov 37.2012	Dec 37.7545 (38)
Heat transfer coeff	81.2497	80.9460	80.6483	79.2500	78.9884	77.7706	77.7706	77.5451	78.2397	78.9884	79.5177	80.0709 (39)
Average = Sum(39)m / 12 =												79.2488 (39)
HLP	Jan 1.0535	Feb 1.0496	Mar 1.0458	Apr 1.0276	May 1.0242	Jun 1.0084	Jul 1.0084	Aug 1.0055	Sep 1.0145	Oct 1.0242	Nov 1.0311	Dec 1.0383 (40)
HLP (average)												1.0276 (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												2.4059 (42)
Average daily hot water use (litres/day)												91.3412 (43)
Daily hot water use	100.4753	96.8216	93.1680	89.5143	85.8607	82.2071	82.2071	85.8607	89.5143	93.1680	96.8216	100.4753 (44)
Energy conte	149.0020	130.3181	134.4766	117.2399	112.4945	97.0742	89.9535	103.2230	104.4558	121.7331	132.8812	144.3004 (45)
Energy content (annual)												Total = Sum(45)m = 1437.1523 (45)
Distribution loss (46)m = 0.15 x (45)m	22.3503	19.5477	20.1715	17.5860	16.8742	14.5611	13.4930	15.4834	15.6684	18.2600	19.9322	21.6451 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	14.1142	12.7281	14.0573	13.5647	13.9884	13.5043	13.9340	13.9693	13.5372	14.0288	13.6216	14.1029	14.1029	14.1029	14.1029	14.1029	14.1029	14.1029	14.1029	14.1029	14.1029	14.1029	14.1029	(61)
Total heat required for water heating calculated for each month	163.1161	143.0462	148.5338	130.8046	126.4829	110.5785	103.8876	117.1922	117.9930	135.7619	146.5028	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	163.1161	143.0462	148.5338	130.8046	126.4829	110.5785	103.8876	117.1922	117.9930	135.7619	146.5028	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	158.4033	(64)
Heat gains from water heating, kWh/month	53.0717	46.5128	48.2278	42.3734	40.9015	35.6533	33.3931	37.8140	38.1159	43.9835	47.5884	51.5056	51.5056	51.5056	51.5056	51.5056	51.5056	51.5056	51.5056	51.5056	51.5056	51.5056	51.5056	(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	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.4505	18.1639	14.7719	11.1833	8.3596	7.0576	7.6259	9.9125	13.3045	16.8931	19.7168	21.0189	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.3163	215.5298	209.9517	198.0767	183.0865	168.9978	159.5858	157.3722	162.9503	174.8254	189.8156	203.9042	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	(71)
Water heating gains (Table 5)	71.3329	69.2154	64.8223	58.8520	54.9752	49.5184	44.8831	50.8252	52.9387	59.1176	66.0950	69.2280	(72)
Total internal gains	367.1889	364.9984	351.6351	330.2011	308.5104	287.6630	274.1840	280.1991	291.2827	312.9253	337.7165	356.2402	(73)

6. Solar gains

[Jan]	Area	Solar flux	α	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
Northeast	4.2300	11.2829	0.7100	0.7000	0.7700	16.4381							
Southwest	6.4500	36.7938	0.7100	0.7000	0.7700	81.7381							
Solar gains	98.1762	172.6905	250.7856	335.0446	397.4662	404.3518	385.7767	337.7153	279.7300	194.7701	118.5868	83.3750	(83)
Total gains	465.3650	537.6888	602.4207	665.2458	705.9767	692.0148	659.9607	617.9144	571.0127	507.6954	456.3033	439.6152	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hi} (C)													21.0000	(85)
Utilisation factor for gains for living area, u_{li} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	56.6190	56.8314	57.0412	58.0476	58.2398	59.1518	59.1518	59.3238	58.7972	58.2398	57.8522	57.4525		
alpha	4.7746	4.7888	4.8027	4.8698	4.8827	4.9435	4.9435	4.9549	4.9198	4.8827	4.8568	4.8302		
util living area	0.9960	0.9915	0.9795	0.9416	0.8461	0.6731	0.5086	0.5606	0.8069	0.9613	0.9920	0.9970	(86)	
MIT	19.7509	19.9223	20.1886	20.5325	20.8068	20.9550	20.9908	20.9855	20.8885	20.5309	20.0831	19.7279	(87)	
Th 2	20.0389	20.0422	20.0454	20.0604	20.0632	20.0763	20.0763	20.0787	20.0713	20.0632	20.0575	20.0516	(88)	
util rest of house	0.9949	0.9891	0.9734	0.9238	0.8013	0.5927	0.4067	0.4562	0.7384	0.9459	0.9892	0.9961	(89)	
MIT 2	18.3682	18.6200	19.0074	19.5046	19.8677	20.0438	20.0723	20.0718	19.9772	19.5125	18.8663	18.3436	(90)	
Living area fraction										f _{LA} = Living area / (4) =		0.1859	(91)	
MIT	18.6253	18.8621	19.2271	19.6957	20.0423	20.2132	20.2431	20.2417	20.1467	19.7019	19.0925	18.6010	(92)	
Temperature adjusted MIT												-0.1500		
adjusted MIT	18.4753	18.7121	19.0771	19.5457	19.8923	20.0632	20.0931	20.0917	19.9967	19.5519	18.9425	18.4510	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	461.6818	529.1850	581.3621	606.4334	559.1012	409.3094	269.6620	282.8407	418.0765	474.5749	449.2320	436.9077	(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	1151.7416	1118.0364	1014.3202	843.6715	647.0966	424.8760	271.6583	286.2707	461.3553	707.0950	941.6895	1141.0875	(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	513.4045	395.7081	322.1208	170.8114	65.4686	0.0000	0.0000	0.0000	0.0000	172.9949	354.5693	523.9097	(98)	
Space heating												2518.9874	(98)	
Space heating per m ²												(98) / (4) =	32.6632	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2783.4115 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	513.4045	395.7081	322.1208	170.8114	65.4686	0.0000	0.0000	0.0000	0.0000	172.9949	354.5693	523.9097	(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)	567.2978	437.2466	355.9346	188.7419	72.3410	0.0000	0.0000	0.0000	0.0000	191.1546	391.7893	578.9058	(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	163.1161	143.0462	148.5338	130.8046	126.4829	110.5785	103.8876	117.1922	117.9930	135.7619	146.5028	158.4033	(64)
Efficiency of water heater (217)m	89.7072	89.6277	89.4651	89.0839	88.3657	87.3000	87.3000	87.3000	87.3000	89.0645	89.5404	87.3000	(216)
Fuel for water heating, kWh/month	181.8317	159.6004	166.0244	146.8331	143.1357	126.6650	119.0006	134.2408	135.1581	152.4310	163.6165	176.5208	(219)
Water heating fuel used													1805.0581 (219)
Annual totals kWh/year													
Space heating fuel - main system													2783.4115 (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)													361.1622 (232)
Total delivered energy for all uses													5024.6318 (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	2783.4115	0.2160	601.2169 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1805.0581	0.2160	389.8925 (264)
Space and water heating			991.1094 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	361.1622	0.5190	187.4432 (268)
Total CO2, kg/year			1217.4776 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.7900 (273)

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

	TFA	N	EF	
DER				15.7900 ZC1
Total Floor Area				77.1200
Assumed number of occupants				2.4059
CO2 emission factor in Table 12 for electricity displaced from grid				0.5190
CO2 emissions from appliances, equation (L14)				16.3909 ZC2
CO2 emissions from cooking, equation (L16)				2.2918 ZC3
Total CO2 emissions				34.4727 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				34.4727 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	38.5600 (1b)	x 2.3300 (2b)	= 89.8448 (1b) - (3b)
First floor	38.5600 (1c)	x 2.5600 (2c)	= 98.7136 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.1200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 188.5584 (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) = 0.1591 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.4091 (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) = 0.3477 (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	0.4434	0.4347	0.4260	0.3825	0.3738	0.3303	0.3303	0.3217	0.3477	0.3738	0.3912	0.4086 (22b)
Effective ac	0.5983	0.5945	0.5907	0.5732	0.5699	0.5546	0.5546	0.5517	0.5605	0.5699	0.5765	0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			10.6800	1.3258	14.1591		(27)					
150mm Platinum			38.5600	0.1300	5.0128		(28a)					
50 mm A. Platinum	45.4100	12.6500	32.7600	0.1800	5.8968		(29a)					
400mm Mineral wool	38.5600		38.5600	0.1300	5.0128		(30)					
Total net area of external elements Aum(A, m ²)			122.5300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.0515		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4874 (36)					
Total fabric heat loss							(33) + (36) = 40.5389 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.2279	Feb 36.9904	Mar 36.7576	Apr 35.6643	May 35.4597	Jun 34.5074	Jul 34.5074	Aug 34.3311	Sep 34.8742	Oct 35.4597	Nov 35.8735	Dec 36.3062 (38)
Heat transfer coeff	77.7669	77.5293	77.2965	76.2032	75.9986	75.0463	75.0463	74.9700	75.4131	75.9986	76.4124	76.8451 (39)
Average = Sum(39)m / 12 =												76.2022 (39)
HLP	Jan 1.0084	Feb 1.0053	Mar 1.0023	Apr 0.9881	May 0.9855	Jun 0.9731	Jul 0.9731	Aug 0.9708	Sep 0.9779	Oct 0.9855	Nov 0.9908	Dec 0.9964 (40)
HLP (average)												0.9881 (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												2.4059 (42)
Average daily hot water use (litres/day)												91.3412 (43)
Daily hot water use	100.4753	96.8216	93.1680	89.5143	85.8607	82.2071	82.2071	85.8607	89.5143	93.1680	96.8216	100.4753 (44)
Energy content (annual)	149.0020	130.3181	134.4766	117.2399	112.4945	97.0742	89.9535	103.2230	104.4558	121.7331	132.8812	144.3004 (45)
Distribution loss (46)m = 0.15 x (45)m	22.3503	19.5477	20.1715	17.5860	16.8742	14.5611	13.4930	15.4834	15.6684	18.2600	19.9322	21.6451 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Total heat required for water heating calculated for each month	50.9589	44.5645	47.4774	44.1441	43.7537	40.5405	41.8918	43.7537	44.1441	47.4774	47.7477	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	50.9589	(61)
Solar input	199.9609	174.8825	181.9540	161.3840	156.2482	137.6147	131.8453	146.9766	148.5998	169.2105	180.6289	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	199.9609	174.8825	181.9540	161.3840	156.2482	137.6147	131.8453	146.9766	148.5998	169.2105	180.6289	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	195.2593	(64)
Total per year (kWh/year) = Sum(64)m =	62.2829	54.4719	56.5828	50.0183	48.3428	42.4123	40.3825	45.2601	45.7676	52.3456	56.1199	60.7196	60.7196	60.7196	60.7196	60.7196	60.7196	60.7196	60.7196	60.7196	60.7196	60.7196	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.4505	18.1639	14.7719	11.1833	8.3596	7.0576	7.6259	9.9125	13.3045	16.8931	19.7168	21.0189	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.3163	215.5298	209.9517	198.0767	183.0865	168.9978	159.5858	157.3722	162.9503	174.8254	189.8156	203.9042	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	(71)
Water heating gains (Table 5)	83.7135	81.0593	76.0522	69.4698	64.9769	58.9060	54.2776	60.8334	63.5661	70.3570	77.9443	81.6124	(72)
Total internal gains	379.5695	376.8423	362.8650	340.8190	318.5122	297.0505	283.5784	290.2073	301.9100	324.1647	349.5659	368.6246	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	(75)						
Northeast	4.2300	11.2829	0.6300	0.7000	0.7700	14.5859	(75)						
Southwest	6.4500	36.7938	0.6300	0.7000	0.7700	72.5281	(79)						
Solar gains	87.1141	153.2324	222.5280	297.2931	352.6813	358.7911	342.3089	299.6629	248.2111	172.8242	105.2249	73.9806	(83)
Total gains	466.6836	530.0747	585.3930	638.1121	671.1935	655.8416	625.8873	589.8701	550.1212	496.9889	454.7908	442.6052	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9979	0.9953	0.9874	0.9585	0.8718	0.6952	0.5212	0.5727	0.8268	0.9724	0.9953	0.9984	(86)
tau	68.8669	69.0778	69.2858	70.2800	70.4691	71.3633	71.3633	71.5314	71.0162	70.4691	70.0875	69.6929	(87)
alpha	5.5911	5.6052	5.6191	5.6853	5.6979	5.7576	5.7576	5.7688	5.7344	5.6979	5.6725	5.6462	(88)
util living area	19.9587	20.0986	20.3207	20.6105	20.8473	20.9694	20.9950	20.9917	20.9177	20.6144	20.2356	19.9362	(87)
MIT	20.0764	20.0789	20.0814	20.0933	20.0955	20.1058	20.1058	20.1077	20.1018	20.0955	20.0910	20.0863	(88)
util rest of house	0.9972	0.9937	0.9830	0.9435	0.8283	0.6130	0.4187	0.4674	0.7576	0.9595	0.9935	0.9979	(89)
MIT 2	18.6822	18.8880	19.2120	19.6321	19.9446	20.0852	20.1039	20.1042	20.0358	19.6454	19.0975	18.6567	(90)
Living area fraction	18.9195	19.1131	19.4182	19.8141	20.1124	20.2496	20.2696	20.2692	20.1998	19.8256	19.3091	18.8946	(92)
Temperature adjustment	18.9195	19.1131	19.4182	19.8141	20.1124	20.2496	20.2696	20.2692	20.1998	19.8256	19.3091	18.8946	(93)
adjusted MIT	18.9195	19.1131	19.4182	19.8141	20.1124	20.2496	20.2696	20.2692	20.1998	19.8256	19.3091	18.8946	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	464.7841	525.4879	572.9792	598.4290	556.5879	411.1462	274.0176	287.2303	421.4288	474.3656	450.7997	411.2432	(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	1136.9140	1101.9333	998.5286	831.6853	639.3313	423.9811	275.3884	289.6881	460.0044	701.1298	932.9307	1129.2091	(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	500.0646	387.3713	316.6087	167.9445	61.5611	0.0000	0.0000	0.0000	0.0000	168.7126	347.1344	511.8466	(98)
Space heating												2461.2439	(98)
Space heating per m2												31.9145	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2635.1648 (211)
Space heating requirement	500.0646	387.3713	316.6087	167.9445	61.5611	0.0000	0.0000	0.0000	0.0000	168.7126	347.1344	511.8466	(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)	535.4011	414.7444	338.9815	179.8121	65.9113	0.0000	0.0000	0.0000	0.0000	180.6344	371.6642	548.0157	(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	199.9609	174.8825	181.9540	161.3840	156.2482	137.6147	131.8453	146.9766	148.5998	169.2105	180.6289	195.2593	(64)
Efficiency of water heater (217)m	87.2647	86.9965	86.4324	85.1516	82.9184	80.3000	80.3000	80.3000	80.3000	85.0438	86.6691	87.3656	(216)
Fuel for water heating, kWh/month	229.1428	201.0224	210.5158	189.5256	188.4361	171.3757	164.1909	183.0344	185.0559	198.9687	208.4122	223.4968	(219)
Water heating fuel used													2353.1774 (219)
Annual totals kWh/year													
Space heating fuel - main system													2635.1648 (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)													361.1622 (232)
Total delivered energy for all uses													5424.5043 (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	2635.1648	0.2160	569.1956	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2353.1774	0.2160	508.2863	(264)
Space and water heating			1077.4819	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	361.1622	0.5190	187.4432	(268)
Total CO2, kg/m2/year			1303.8501	(272)
Emissions per m2 for space and water heating			13.9715	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.4305	(272b)
Emissions per m2 for pumps and fans			0.5047	(272c)
Target Carbon Dioxide Emission Rate (TER) - (13.9715 * 1.00) 2.4305 0.5047, rounded to 2 d.p.			16.9100	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	38.5600 (1b)	x 2.3300 (2b)	= 89.8448 (1b) - (3b)
First floor	38.5600 (1c)	x 2.5600 (2c)	= 98.7136 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 188.5584 (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) = 0.1591 (8)							
Pressure test					Yes							
Measured/design AP50					5.0100							
Infiltration rate					0.4096 (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) =	0.3482 (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	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3220	0.3482	0.3743	0.3917	0.4091 (22b)
Effective ac	0.5985	0.5947	0.5910	0.5733	0.5700	0.5547	0.5547	0.5519	0.5606	0.5700	0.5767	0.5837 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			10.6800	1.3347	14.2548		(27)					
150mm Platinum			38.5600	0.1200	4.6272		(28a)					
50 mm A. Platinum	45.4100	12.6500	32.7600	0.2700	8.8452		(29a)					
400mm Mineral wool	38.5600		38.5600	0.1100	4.2416		(30)					
Total net area of external elements Aum(A, m ²)			122.5300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.9388	(33)					
E-WM-22			81.0400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							214.7430 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3776 (36)					
Total fabric heat loss						(33) + (36) =	42.3164 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.2429	Feb 37.0048	Mar 36.7714	Apr 35.6754	May 35.4703	Jun 34.5157	Jul 34.5157	Aug 34.3390	Sep 34.8834	Oct 35.4703	Nov 35.8852	Dec 36.3189 (38)
Heat transfer coeff	79.5593	79.3212	79.0879	77.9919	77.7868	76.8322	76.8322	76.6554	77.1999	77.7868	78.2016	78.6353 (39)
Average = Sum(39)m / 12 =												77.9909 (39)
HLP	Jan 1.0316	Feb 1.0285	Mar 1.0255	Apr 1.0113	May 1.0086	Jun 0.9963	Jul 0.9963	Aug 0.9940	Sep 1.0010	Oct 1.0086	Nov 1.0140	Dec 1.0196 (40)
HLP (average)												1.0113 (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												2.4059 (42)
Average daily hot water use (litres/day)												91.3412 (43)
Daily hot water use	100.4753	96.8216	93.1680	89.5143	85.8607	82.2071	82.2071	85.8607	89.5143	93.1680	96.8216	100.4753 (44)
Energy conte	149.0020	130.3181	134.4766	117.2399	112.4945	97.0742	89.9535	103.2230	104.4558	121.7331	132.8812	144.3004 (45)
Energy content (annual)												Total = Sum(45)m = 1437.1523 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	31.6629	27.6926	28.5763	24.9135	23.9051	20.6283	19.1151	21.9349	22.1969	25.8683	28.2373	30.6638	(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	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.4505	18.1639	14.7719	11.1833	8.3596	7.0576	7.6259	9.9125	13.3045	16.8931	19.7168	21.0189	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.3163	215.5298	209.9517	198.0767	183.0865	168.9978	159.5858	157.3722	162.9503	174.8254	189.8156	203.9042	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses c.g. evaporation (negative values) (Table 5)	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	(71)
Water heating gains (Table 5)	42.5577	41.2092	38.4090	34.6021	32.1305	28.6504	25.6924	29.4824	30.8290	34.7692	39.2184	41.2148	(72)
Total internal gains	335.4136	333.9922	322.2218	302.9512	282.6658	263.7949	251.9932	255.8562	266.1729	285.5769	307.8399	325.2271	(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						
Northeast	4.2300	11.2829	0.7100	0.7000	0.7700	16.4381	(75)						
Southwest	6.4500	36.7938	0.7100	0.7000	0.7700	81.7381	(79)						
Solar gains	98.1762	172.6905	250.7856	335.0446	397.4662	404.3518	385.7767	337.7153	279.7300	194.7701	118.5868	83.3750	(83)
Total gains	433.5898	506.6826	573.0074	637.9958	680.1320	668.1468	637.7699	593.5715	545.9030	480.3470	426.4267	408.6020	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000	(85)
tau	57.8219	57.9955	58.1666	58.9840	59.1395	59.8743	59.8743	60.0124	59.5891	59.1395	58.8258	58.5013		
alpha	4.8548	4.8664	4.8778	4.9323	4.9426	4.9916	4.9916	5.0008	4.9726	4.9426	4.9217	4.9001		
util living area	0.9971	0.9933	0.9827	0.9479	0.8563	0.6859	0.5193	0.5754	0.8222	0.9676	0.9939	0.9978	(86)	
MIT	19.7410	19.9123	20.1791	20.5219	20.8010	20.9527	20.9903	20.9843	20.8815	20.5142	20.0650	19.7138	(87)	
Th 2	20.0571	20.0596	20.0621	20.0739	20.0761	20.0864	20.0864	20.0884	20.0825	20.0761	20.0717	20.0670	(88)	
util rest of house	0.9962	0.9913	0.9776	0.9317	0.8134	0.6060	0.4168	0.4701	0.7562	0.9545	0.9918	0.9972	(89)	
MIT 2	18.9029	19.0754	19.3414	19.6831	19.9373	20.0629	20.0835	20.0832	20.0132	19.6828	19.2377	18.8837	(90)	
Living area fraction									FLA = Living area / (4) =			0.1859	(91)	
MIT	19.0587	19.2310	19.4971	19.8391	20.0979	20.2283	20.2521	20.2507	20.1746	19.8374	19.3916	19.0381	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.0587	19.2310	19.4971	19.8391	20.0979	20.2283	20.2521	20.2507	20.1746	19.8374	19.3916	19.0381	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9950	0.9890	0.9736	0.9268	0.8145	0.6191	0.4359	0.4896	0.7637	0.9502	0.9897	0.9962	(94)
Useful gains	431.4135	501.1298	557.8582	591.2913	553.9804	413.6624	277.9745	290.5993	416.8950	456.4048	422.0466	407.0460	(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	1174.1926	1136.7564	1027.9161	853.1580	653.2464	432.4358	280.6024	295.1789	468.9601	718.5495	961.2209	1166.7956	(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	552.6276	427.1411	349.7231	188.5440	73.8539	0.0000	0.0000	0.0000	0.0000	195.0357	388.2055	565.2537	(98)
Space heating												2740.3846	(98)
Space heating per m2												35.5340	(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	722.2225	568.5582	582.5811	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9006	0.9477	0.9300	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	650.4411	538.8102	541.7892	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	871.1094	833.8133	783.8401	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	158.8812	219.4822	180.0859	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												558.4493	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.7203	54.8706	45.0215	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											139.6123 (107)	
Space cooling per m2											1.8103 (108)	
Energy for space heating											35.5340 (99)	
Energy for space cooling											1.8103 (108)	
Total											37.3444 (109)	
Dwelling Fabric Energy Efficiency (DFEE)											37.3 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	38.5600 (1b)	2.3300 (2b)	89.8448 (1b) - (3b)
First floor	38.5600 (1c)	2.5600 (2c)	98.7136 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.1200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 188.5584 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1591 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.4091 (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) =		0.3477 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4434	0.4347	0.4260	0.3825	0.3738	0.3303	0.3303	0.3217	0.3477	0.3738	0.3912	0.4086 (22b)
Effective ac	0.5983	0.5945	0.5907	0.5732	0.5699	0.5546	0.5546	0.5517	0.5605	0.5699	0.5765	0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			10.6800	1.3258	14.1591		(27)					
150mm Platinum			38.5600	0.1300	5.0128		(28a)					
50 mm A. Platinum	45.4100	12.6500	32.7600	0.1800	5.8968		(29a)					
400mm Mineral wool	38.5600		38.5600	0.1300	5.0128		(30)					
Total net area of external elements Aum(A, m2)			122.5300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.0515		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4874 (36)					
Total fabric heat loss							(33) + (36) = 40.5389 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.2279	Feb 36.9904	Mar 36.7576	Apr 35.6643	May 35.4597	Jun 34.5074	Jul 34.5074	Aug 34.3311	Sep 34.8742	Oct 35.4597	Nov 35.8735	Dec 36.3062 (38)
Heat transfer coeff	77.7669	77.5293	77.2965	76.2032	75.9986	75.0463	75.0463	74.9700	75.4131	75.9986	76.4124	76.8451 (39)
Average = Sum(39)m / 12 =												76.2022 (39)
HLP	Jan 1.0084	Feb 1.0053	Mar 1.0023	Apr 0.9881	May 0.9855	Jun 0.9731	Jul 0.9731	Aug 0.9708	Sep 0.9779	Oct 0.9855	Nov 0.9908	Dec 0.9964 (40)
HLP (average)												0.9881 (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												2.4059 (42)
Average daily hot water use (litres/day)												91.3412 (43)
Daily hot water use	100.4753	96.8216	93.1680	89.5143	85.8607	82.2071	82.2071	85.8607	89.5143	93.1680	96.8216	100.4753 (44)
Energy content (annual)	149.0020	130.3181	134.4766	117.2399	112.4945	97.0742	89.9535	103.2230	104.4558	121.7331	132.8812	144.3004 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1437.1523 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	31.6629	27.6926	28.5763	24.9135	23.9051	20.6283	19.1151	21.9349	22.1969	25.8683	28.2373	30.6638	(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	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	120.2972	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.4505	18.1639	14.7719	11.1833	8.3596	7.0576	7.6259	9.9125	13.3045	16.8931	19.7168	21.0189	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.3163	215.5298	209.9517	198.0767	183.0865	168.9978	159.5858	157.3722	162.9503	174.8254	189.8156	203.9042	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	35.0297	(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)	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	-96.2378	(71)
Water heating gains (Table 5)	42.5577	41.2092	38.4090	34.6021	32.1305	28.6504	25.6924	29.4824	30.8290	34.7692	39.2184	41.2148	(72)
Total internal gains	335.4136	333.9922	322.2218	302.9512	282.6658	263.7949	251.9932	255.8562	266.1729	285.5769	307.8399	325.2271	(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							
Northeast	4.2300	11.2829	0.6300	0.7000	0.7700	14.5859	(75)						
Southwest	6.4500	36.7938	0.6300	0.7000	0.7700	72.5281	(79)						
Solar gains	87.1141	153.2324	222.5280	297.2931	352.6813	358.7911	342.3089	299.6629	248.2111	172.8242	105.2249	73.9806	(83)
Total gains	422.5277	487.2245	544.7498	600.2443	635.3471	622.5860	594.3021	555.5191	514.3841	458.4011	413.0648	399.2077	(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)	68.8669	69.0778	69.2858	70.2800	70.4691	71.3633	71.3633	71.5314	71.0162	70.4691	70.0875	69.6929	21.0000 (85)
alpha	5.5911	5.6052	5.6191	5.6853	5.6979	5.7576	5.7576	5.7688	5.7344	5.6979	5.6725	5.6462	
util living area	0.9987	0.9969	0.9910	0.9678	0.8920	0.7236	0.5471	0.6044	0.8564	0.9807	0.9971	0.9991	(86)
MIT	19.9041	20.0463	20.2730	20.5719	20.8242	20.9625	20.9936	20.9891	20.8996	20.5721	20.1845	19.8823	(87)
Th 2	20.0764	20.0789	20.0814	20.0933	20.0955	20.1058	20.1058	20.1077	20.1018	20.0955	20.0910	20.0863	(88)
util rest of house	0.9983	0.9958	0.9878	0.9556	0.8525	0.6412	0.4404	0.4951	0.7921	0.9711	0.9959	0.9988	(89)
MIT 2	19.0700	19.2139	19.4411	19.7427	19.9744	20.0882	20.1041	20.1045	20.0450	19.7484	19.3620	19.0564	(90)
Living area fraction	19.2251	19.3686	19.5957	19.8969	20.1324	20.2508	20.2695	20.2690	20.2039	19.9015	19.5149	19.2100	(92)
MIT	19.2251	19.3686	19.5957	19.8969	20.1324	20.2508	20.2695	20.2690	20.2039	19.9015	19.5149	19.2100	(93)
Temperature adjustment													0.0000
adjusted MIT	19.2251	19.3686	19.5957	19.8969	20.1324	20.2508	20.2695	20.2690	20.2039	19.9015	19.5149	19.2100	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9979	0.9947	0.9856	0.9523	0.8543	0.6554	0.4604	0.5155	0.8004	0.9685	0.9949	0.9984	(94)
Useful gains	421.5812	484.6420	536.8813	571.6228	542.8063	408.0519	273.6101	286.3914	411.7179	443.9501	410.9700	398.5540	(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	1160.6762	1121.7436	1012.2553	837.9965	640.8538	424.0692	275.3826	289.6707	460.3150	706.9043	948.6536	1153.4418	(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	549.8867	428.1323	353.6782	191.7891	72.9473	0.0000	0.0000	0.0000	0.0000	195.6379	387.1322	561.6365	(98)
Space heating													2740.8402 (98)
Space heating per m2										(98) / (4) =			35.5399 (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	705.4355	555.3428	569.0118	0.0000	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9071	0.9554	0.9387	0.0000	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	639.9314	530.5750	534.1500	0.0000	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.8565	783.0067	739.3633	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	128.1061	187.8092	152.6787	0.0000	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling													468.5939 (104)
Cooled fraction													1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	32.0265	46.9523	38.1697	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling											117.1485	(107)
Space cooling per m2											1.5190	(108)
Energy for space heating											35.5399	(99)
Energy for space cooling											1.5190	(108)
Total											37.0590	(109)
Target Fabric Energy Efficiency (TFEE)											42.6	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Kingsville End-Terrace			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 019, Chipping Lane , Longridge , PR3				
SAP Rating	85 B	DER	16.19	TER	16.48
Environmental	86 B	% DER<TER	1.78		
CO₂ Emissions (t/year)	1.51	DFEE	46.05	TFEE	48.23
General Requirements Compliance	Pass	% DFEE<TFEE	4.51		
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 Designed)

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

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

DWELLING AS DESIGNED

End-Terrace House, total floor area 104 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.48 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.19 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.30 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.17 (max. 0.20)	0.19 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.90 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 35

Combi boiler

Efficiency: 89.6% SEDBUK2009

OK

Minimum: 88.0%

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

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

Based on:

Overshading: Average
Windows facing South East: 4.41 m², No overhang
Windows facing South West: 1.02 m², No overhang
Windows facing North West: 6.61 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	36.1000 (1b)	x 2.3100 (2b)	= 83.3910 (1b) - (3b)
First floor	36.1000 (1c)	x 2.5500 (2c)	= 92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	x 2.3500 (2d)	= 75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.2100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans - (6a)+(6b)+(7a)+(7b)+(7c) -					Air changes per hour 40.0000 / (5) = 0.1592 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.4097 (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) =	0.3483 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4440	0.4353	0.4266	0.3831	0.3744	0.3309	0.3309	0.3221	0.3483	0.3744	0.3918	0.4092 (22b)
Effective ac	0.5986	0.5948	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5768	0.5837 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			1.9700	1.0000	1.9700		(26)
Opening Type 2 (Uw = 1.41)			12.0400	1.3347	16.0700		(27)
Opening Type 9 (Uw = 1.90)			1.3500	1.7658	2.3838		(27a)
150mm Platinium			36.1000	0.1500	5.4150		(28a)
50mm A. Platinium	106.2200	13.0400	93.1800	0.2700	25.1586		(29a)
Dormer wall	4.6500	0.9700	3.6800	0.3000	1.1040		(29a)
Wall to Roofspace	5.2700		5.2700	0.1200	0.6324		(29a)
Ceiling to I-Roof	16.6600		16.6600	0.1900	3.1654		(30)
Ceiling to Roofspace	3.8700		3.8700	0.1200	0.4644		(30)
Dormer roof	1.8700		1.8700	0.1700	0.3179		(30)
I-Roof	17.2700	1.3500	15.9200	0.1600	2.5472		(30)
Total net area of external elements Aum(A, m ²)			191.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.2288		(33)
E-WM-22			62.5700	0.0000	0.0000		(32)
Thermal mass parameter (TMP - Cm / TFA) in kJ/m ² K							180.2930 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7384 (36)
Total fabric heat loss						(33) + (36) =	69.9672 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	49.6225	49.3051	48.9941	47.5329	47.2596	45.9870	45.9870	45.7513	46.4772	47.2596	47.8126	48.3908 (38)
Heat transfer coeff	119.5897	119.2724	118.9613	117.5002	117.2268	115.9542	115.9542	115.7185	116.4444	117.2268	117.7798	118.3580 (39)
Average - Sum(39)m / 12 =												117.4988 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1451	1.1420	1.1390	1.1250	1.1224	1.1102	1.1102	1.1080	1.1149	1.1224	1.1277	1.1333 (40)
HLP (average)												1.1250 (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												2.7770 (42)
Average daily hot water use (litres/day)												100.1538 (43)
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	94.1446	98.1507	102.1569	106.1630	110.1692 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)
Energy content (annual)												1575.8093 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.5067	21.4337	22.1176	19.2827	18.5022	15.9660	14.7948	16.9773	17.1801	20.0217	21.8553	23.7334 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.1487	12.7682	14.1104	13.6156	14.0353	13.5431	13.9699	14.0123	13.5826	14.0769	13.6625	14.1363 (61)
Total heat required for water heating calculated for each month												
	177.5264	155.6594	161.5614	142.1669	137.3833	119.9830	112.6022	127.1943	128.1163	147.5549	159.3642	172.3589 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h												
	177.5264	155.6594	161.5614	142.1669	137.3833	119.9830	112.6022	127.1943	128.1163	147.5549	159.3642	172.3589 (64)
Heat gains from water heating, kWh/month												
	57.8603	50.7034	52.5550	46.1472	44.5220	38.7771	36.2877	41.1361	41.4781	47.9007	51.8614	56.1431 (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	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	25.5604	22.7025	18.4629	13.9776	10.4484	8.8210	9.5314	12.3893	16.6289	21.1142	24.6433	26.2708 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801 (71)
Water heating gains (Table 5)												
	77.7692	75.4515	70.6385	64.0933	59.8414	53.8570	48.7738	55.2904	57.6085	64.3826	72.0298	75.4611 (72)
Total internal gains												
	434.2968	431.8536	415.9156	390.2269	363.9423	338.9398	322.9489	329.5911	343.0342	368.9519	398.6317	421.0812 (73)

6. Solar gains

[Jan]												
	Area	Solar flux	Specific data	Specific data	Access	Gains						
	m2	Table 6a	or Table 6b	or Table 6c	factor	W						
		W/m2			Table 6d							
Southeast	4.4100	36.7938	0.7100	0.7000	0.7700	55.8860 (77)						
Southwest	1.0200	36.7938	0.7100	0.7000	0.7700	12.9260 (79)						
Northwest	6.6100	11.2829	0.7100	0.7000	0.7700	25.6870 (81)						
Northwest	1.3500	17.0692	0.7600	0.7000	1.0000	11.0332 (82)						
Solar gains	105.5322	192.4482	297.2823	425.7133	529.5093	548.9339	519.5475	438.5005	341.1595	221.8288	128.7074	88.8261 (83)
Total gains	539.8291	624.3018	713.1979	815.9401	893.4516	887.8737	842.4965	768.0916	684.1937	590.7807	527.3391	509.9073 (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)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.7370	43.8534	43.9681	44.5148	44.6186	45.1083	45.1083	45.2002	44.9184	44.6186	44.4091	44.1922
alpha	3.9158	3.9236	3.9312	3.9677	3.9746	4.0072	4.0072	4.0133	3.9946	3.9746	3.9606	3.9461
util living area	0.9956	0.9918	0.9815	0.9498	0.8698	0.7230	0.5707	0.6350	0.8584	0.9702	0.9923	0.9965 (86)
MIT	19.3143	19.4963	19.8149	20.2495	20.6365	20.8933	20.9659	20.9490	20.7486	20.2501	19.7085	19.2859 (87)
Th 2	19.9642	19.9667	19.9691	19.9804	19.9826	19.9925	19.9925	19.9943	19.9887	19.9826	19.9783	19.9738 (88)
util rest of house	0.9945	0.9896	0.9765	0.9352	0.8308	0.6425	0.4549	0.5193	0.8007	0.9590	0.9900	0.9957 (89)
MIT 2	17.7038	17.9707	18.4348	19.0646	19.5937	19.8989	19.9752	19.9652	19.7538	19.0757	18.2889	17.6683 (90)
Living area fraction												
	17.9104	18.1665	18.6118	19.2167	19.7275	20.0252	20.1023	20.0913	19.8814	19.2264	18.4710	17.8759 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.7604	18.0165	18.4618	19.0667	19.5775	19.8752	19.9523	19.9413	19.7314	19.0764	18.3210	17.7259 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	534.8306	613.8833	688.8505	748.8537	725.4391	561.1089	379.0774	383.7489	535.3476	557.9822	518.9214	506.0902 (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												
	1609.7306	1564.4322	1422.9953	1194.5843	923.4525	611.6858	388.7124	409.7963	655.7456	993.6556	1321.6130	1600.8938 (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												
	799.7256	638.7016	546.2037	320.9260	147.3220	0.0000	0.0000	0.0000	0.0000	324.1410	577.9379	814.5339 (98)
Space heating												
Space heating per m2												4169.4918 (98)
												(98) / (4) = 39.9224 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4607.1732 (211)
Space heating requirement	799.7256	638.7016	546.2037	320.9260	147.3220	0.0000	0.0000	0.0000	0.0000	324.1410	577.9379	814.5339	(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)	883.6746	705.7477	603.5400	354.6144	162.7867	0.0000	0.0000	0.0000	0.0000	358.1669	638.6054	900.0374	(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	177.5264	155.6594	161.5614	142.1669	137.3833	119.9830	112.6022	127.1943	128.1163	147.5549	159.3642	172.3589	(64)
Efficiency of water heater (217)m	89.9014	89.8546	89.7490	89.4929	88.9271	87.3000	87.3000	87.3000	87.3000	89.4741	89.7886	89.9243	(217)
Fuel for water heating, kWh/month	197.4679	173.2348	180.0146	158.8582	154.4898	137.4376	128.9830	145.6979	146.7541	164.9136	177.4882	191.6710	(219)
Water heating fuel used													1957.0107 (219)
Annual totals kWh/year													
Space heating fuel - main system													4607.1732 (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)													451.4040 (232)
Total delivered energy for all uses													7090.5879 (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	4607.1732	0.2160	995.1494	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1957.0107	0.2160	422.7143	(264)
Space and water heating			1417.8637	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	451.4040	0.5190	234.2787	(268)
Total CO2, kg/year			1691.0674	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.1900	(273)

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

DER			16.1900	ZC1
Total Floor Area		TFA	104.4400	
Assumed number of occupants		N	2.7770	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			14.9400	ZC2
CO2 emissions from cooking, equation (L16)			1.7776	ZC3
Total CO2 emissions			32.9076	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			32.9076	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 (m2)	Storey height (m)	Volume (m3)
Ground floor	36.1000 (1b)	x 2.3100 (2b)	= 83.3910 (1b) - (3b)
First floor	36.1000 (1c)	x 2.5500 (2c)	= 92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	x 2.3500 (2d)	= 75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 251.2100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour	
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)	
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)	
Number of intermittent fans				4 * 10 =	40.0000 (7a)	
Number of passive vents				0 * 10 =	0.0000 (7b)	
Number of flueless gas fires				0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans - (6a)+(6b)+(7a)+(7b)+(7c) -				Air changes per hour	40.0000 / (5) =	0.1592 (8)
Pressure test				Yes		
Measured/design AP50				Yes		5.0000
Infiltration rate						0.4092 (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) =			0.3478 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4435	0.4348	0.4261	0.3826	0.3739	0.3305	0.3305	0.3218	0.3478	0.3739	0.3913	0.4087 (22b)
Effective ac	0.5983	0.5945	0.5908	0.5732	0.5699	0.5546	0.5546	0.5518	0.5605	0.5699	0.5766	0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.9700	1.0000	1.9700		(26)
TER Opening Type (Uw = 1.40)			12.0400	1.3258	15.9621		(27)
TER Room Window (Uw = 1.70)			1.3500	1.5918	2.1489		(27a)
150mm Platinum			36.1000	0.1300	4.6930		(28a)
50mm A. Platinum	106.2200	13.0400	93.1800	0.1800	16.7724		(29a)
Dormer wall	4.6500	0.9700	3.6800	0.1800	0.6624		(29a)
Wall to Roofspace	5.2700		5.2700	0.1800	0.9486		(29a)
Ceiling to I-Roof	16.6600		16.6600	0.1300	2.1658		(30)
Ceiling to Roofspace	3.8700		3.8700	0.1300	0.5031		(30)
Dormer roof	1.8700		1.8700	0.1300	0.2431		(30)
I-Roof	17.2700	1.3500	15.9200	0.1300	2.0696		(30)
Total net area of external elements Aum(A, m2)			191.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.1390		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0228 (36)
Total fabric heat loss						(33) + (36) =	59.1618 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	49.6026	49.2860	48.9757	47.5181	47.2454	45.9759	45.9759	45.7408	46.4649	47.2454	47.7971	48.3738 (38)
Average - Sum(39)m / 12 =	108.7644	108.4478	108.1375	106.6799	106.4072	105.1377	105.1377	104.9026	105.6267	106.4072	106.9589	107.5356 (39)
												106.6786 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0414	1.0384	1.0354	1.0214	1.0188	1.0067	1.0067	1.0044	1.0114	1.0188	1.0241	1.0296 (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												2.7770 (42)
Average daily hot water use (litres/day)												100.1538 (43)
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	94.1446	98.1507	102.1569	106.1630	110.1692 (44)
Energy conte	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1575.8093 (45)
Distribution loss (46)m - 0.15 x (45)m													
	24.5067	21.4337	22.1176	19.2827	18.5022	15.9660	14.7948	16.9773	17.1801	20.0217	21.8553	23.7334	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	48.4031	47.9750	44.4518	45.9336	47.9750	48.4031	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	214.3366	188.9186	198.4098	176.9544	171.3231	150.8918	144.5658	161.1570	162.9368	184.4369	195.0167	209.1815	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)	
Output from w/h	214.3366	188.9186	198.4098	176.9544	171.3231	150.8918	144.5658	161.1570	162.9368	184.4369	195.0167	209.1815	(64)
Total per year (kWh/year) = Sum(64)m =												2158.1290 (64)	
Heat gains from water heating, kWh/month	67.0628	59.0182	61.7672	54.8441	53.0070	46.5042	44.2786	49.6268	50.1832	57.1212	60.7746	65.3487	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.5604	22.7025	18.4629	13.9776	10.4484	8.8210	9.5314	12.3893	16.6289	21.1142	24.6433	26.2708	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	(71)
Water heating gains (Table 5)	90.1382	87.8247	83.0204	76.1723	71.2459	64.5892	59.5143	66.7026	69.6989	76.7758	84.4091	87.8343	(72)
Total internal gains	446.6659	444.2268	428.2975	402.3058	375.3468	349.6720	333.6894	341.0033	355.1246	381.3450	411.0111	433.4544	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	PF Specific data or Table 6c	Access factor Table 6d	Gains W							
Southeast	4.4100	36.7938	0.6300	0.7000	0.7700	49.5890 (77)							
Southwest	1.0200	36.7938	0.6300	0.7000	0.7700	11.4696 (79)							
Northwest	6.6100	11.2829	0.6300	0.7000	0.7700	22.7927 (81)							
Northwest	1.3500	17.0692	0.6300	0.7000	1.0000	9.1459 (82)							
Solar gains	92.9972	169.4242	261.2928	373.5255	464.0685	480.8790	455.2212	384.5431	299.6415	195.1769	113.3899	78.2945	(83)
Total gains	539.6631	613.6510	689.5903	775.8313	839.4153	830.5510	788.9106	725.5463	654.7661	576.5220	524.4010	511.7489	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.6834	66.8781	67.0700	67.9864	68.1606	68.9836	68.9836	69.1382	68.6643	68.1606	67.8090	67.4454	
alpha	5.4456	5.4585	5.4713	5.5324	5.5440	5.5989	5.5989	5.6092	5.5776	5.5440	5.5206	5.4964	
util living area	0.9991	0.9978	0.9937	0.9752	0.9076	0.7471	0.5738	0.6408	0.8895	0.9869	0.9979	0.9993	(86)
MIT	19.8283	19.9594	20.1893	20.5081	20.7902	20.9517	20.9908	20.9837	20.8649	20.5047	20.1133	19.8092	(87)
Th 2	20.0490	20.0515	20.0539	20.0655	20.0677	20.0778	20.0778	20.0796	20.0739	20.0677	20.0633	20.0587	(88)
util rest of house	0.9987	0.9971	0.9914	0.9654	0.8710	0.6634	0.4601	0.5247	0.8319	0.9801	0.9971	0.9991	(89)
MIT 2	18.4716	18.6650	19.0020	19.4692	19.8528	20.0440	20.0742	20.0724	19.9572	19.4708	18.8991	18.4507	(90)
Living area fraction												fLA = Living area / (4) =	
MIT	18.6457	18.8311	19.1543	19.6025	19.9731	20.1605	20.1918	20.1894	20.0737	19.6034	19.0549	18.6250	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6457	18.8311	19.1543	19.6025	19.9731	20.1605	20.1918	20.1894	20.0737	19.6034	19.0549	18.6250	(93)

8. Space heating requirement

Utilisation	0.9980	0.9956	0.9882	0.9589	0.8666	0.6715	0.4746	0.5392	0.8318	0.9753	0.9957	0.9985	(94)
Useful gains	538.5732	610.9778	681.4449	743.9516	727.4335	557.7258	374.4242	391.2472	544.6665	562.2637	522.1378	510.9755	(95)
Ext temp.	4.3000	4.9000	6.5000	8.0000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1560.2986	1510.7978	1368.4055	1141.7379	880.3142	584.6148	377.6314	397.5143	630.9816	958.0294	1278.6814	1551.2056	(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	760.1637	604.6790	511.0986	286.4062	113.7432	0.0000	0.0000	0.0000	0.0000	294.4497	544.7114	773.9312	(98)
Space heating												3889.1830 (98)	
Space heating per m ²												(98) / (4) = 37.2384 (99)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4164.0075 (211)
Space heating requirement	760.1637	604.6790	511.0986	286.4062	113.7432	0.0000	0.0000	0.0000	0.0000	294.4497	544.7114	773.9312	(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)	813.8797	647.4079	547.2148	306.6447	121.7807	0.0000	0.0000	0.0000	0.0000	315.2566	583.2028	828.6202	(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	214.3366	188.9186	198.4098	176.9544	171.3231	150.8918	144.5658	161.1570	162.9368	184.4369	195.0167	209.1815	(64)
Efficiency of water heater (217)m	87.9665	87.7719	87.3284	86.2567	84.0467	80.3000	80.3000	80.3000	80.3000	86.2232	87.4986	80.3000	(216)
Fuel for water heating, kWh/month	243.6572	215.2380	227.1997	205.1484	203.8426	187.9101	180.0321	200.6937	202.9101	213.9064	222.8798	237.5882	(219)
Water heating fuel used													2541.0063 (219)
Annual totals kWh/year													
Space heating fuel - main system													4164.0075 (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)													451.4040 (232)
Total delivered energy for all uses													7231.4178 (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	4164.0075	0.2160	899.4256 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2541.0063	0.2160	548.8574 (264)
Space and water heating			1448.2830 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	451.4040	0.5190	234.2787 (268)
Total CO2, kg/m2/year			1721.4866 (272)
Emissions per m2 for space and water heating			13.8671 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2432 (272b)
Emissions per m2 for pumps and fans			0.3727 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8671 * 1.00) + 2.2432 + 0.3727, rounded to 2 d.p.			16.4800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	36.1000 (1b)	x 2.3100 (2b)	= 83.3910 (1b) - (3b)
First floor	36.1000 (1c)	x 2.5500 (2c)	= 92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	x 2.3500 (2d)	= 75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.2100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour	
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)	
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)	
Number of intermittent fans				4 * 10 =	40.0000 (7a)	
Number of passive vents				0 * 10 =	0.0000 (7b)	
Number of flueless gas fires				0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans - (6a)+(6b)+(7a)+(7b)+(7c) -					Air changes per hour	
Pressure test					40.0000 / (5) =	0.1592 (8)
Measured/design AP50					Yes	5.0100
Infiltration rate						0.4097 (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) =		0.3483 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4440	0.4353	0.4266	0.3831	0.3744	0.3309	0.3309	0.3221	0.3483	0.3744	0.3918	0.4092 (22b)
Effective ac	0.5986	0.5948	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5768	0.5837 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			1.9700	1.0000	1.9700		(26)
Opening Type 2 (Uw = 1.41)			12.0400	1.3347	16.0700		(27)
Opening Type 9 (Uw = 1.90)			1.3500	1.7658	2.3838		(27a)
150mm Platinium			36.1000	0.1500	5.4150		(28a)
50mm A. Platinium	106.2200	13.0400	93.1800	0.2700	25.1586		(29a)
Dormer wall	4.6500	0.9700	3.6800	0.3000	1.1040		(29a)
Wall to Roofspace	5.2700		5.2700	0.1200	0.6324		(29a)
Ceiling to I-Roof	16.6600		16.6600	0.1900	3.1654		(30)
Ceiling to Roofspace	3.8700		3.8700	0.1200	0.4644		(30)
Dormer roof	1.8700		1.8700	0.1700	0.3179		(30)
I-Roof	17.2700	1.3500	15.9200	0.1600	2.5472		(30)
Total net area of external elements Aum(A, m ²)			191.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.2288		(33)
E-WM-22			62.5700	0.0000	0.0000		(32)
Thermal mass parameter (TMP - Cm / TFA) in kJ/m ² K							180.2930 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7384 (36)
Total fabric heat loss						(33) + (36) =	69.9672 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	49.6225	49.3051	48.9941	47.5329	47.2596	45.9870	45.9870	45.7513	46.4772	47.2596	47.8126	48.3908 (38)
Heat transfer coeff	119.5897	119.2724	118.9613	117.5002	117.2268	115.9542	115.9542	115.7185	116.4444	117.2268	117.7798	118.3580 (39)
Average = Sum(39)m / 12 =												117.4988 (39)
HLP	1.1451	1.1420	1.1390	1.1250	1.1224	1.1102	1.1102	1.1080	1.1149	1.1224	1.1277	1.1333 (40)
HLP (average)												1.1250 (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												2.7770 (42)
Average daily hot water use (litres/day)												100.1538 (43)
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	91.1446	98.1507	102.1569	106.1630	110.1692 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)
Energy content (annual)										Total -	Sum(45)m -	1575.8093 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	34.7178	30.3644	31.3333	27.3171	26.2115	22.6185	20.9594	24.0512	24.3384	28.3641	30.9616	33.6223 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.5604	22.7025	18.4629	13.9776	10.4484	8.8210	9.5314	12.3893	16.6289	21.1142	24.6433	26.2708 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850 (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)	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801 (71)
Water heating gains (Table 5)	46.6637	45.1851	42.1147	37.9405	35.2304	31.4146	28.1712	32.3268	33.8034	38.1238	43.0022	45.1913 (72)
Total internal gains	400.1913	398.5873	384.3918	361.0740	336.3313	313.4973	299.3463	303.6275	316.2290	339.6930	366.6042	387.8113 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Southeast	4.4100	36.7938	0.7100	0.7000	0.7700	55.8860 (77)						
Southwest	1.0200	36.7938	0.7100	0.7000	0.7700	12.9260 (79)						
Northwest	6.6100	11.2829	0.7100	0.7000	0.7700	25.6870 (81)						
Northwest	1.3500	17.0692	0.7600	0.7000	1.0000	11.0332 (82)						
Solar gains	105.5322	192.4482	297.2823	425.7133	529.5093	548.9339	519.5475	438.5005	341.1595	221.8288	128.7074	88.8261 (83)
Total gains	505.7236	591.0354	681.6741	786.7873	865.8406	862.4312	818.8938	742.1280	657.3886	561.5218	495.3116	476.6375 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	43.7370	43.8534	43.9681	44.5148	44.6186	45.1083	45.1083	45.2002	44.9184	44.6186	44.4091	44.1922
alpha	3.9158	3.9236	3.9312	3.9677	3.9746	4.0072	4.0072	4.0133	3.9946	3.9746	3.9606	3.9461
util living area	0.9965	0.9932	0.9841	0.9549	0.8793	0.7361	0.5841	0.6514	0.8711	0.9747	0.9939	0.9973 (86)
MIT	19.2756	19.4592	19.7810	20.2221	20.6182	20.8751	20.9629	20.9430	20.7316	20.2200	19.6725	19.2478 (87)
Th 2	19.9642	19.9667	19.9691	19.9804	19.9826	19.9925	19.9925	19.9943	19.9887	19.9826	19.9783	19.9738 (88)
util rest of house	0.9957	0.9914	0.9797	0.9416	0.8420	0.6563	0.4668	0.5349	0.8163	0.9649	0.9920	0.9966 (89)
MIT 2	18.3824	18.5671	18.8884	19.3294	19.7017	19.9235	19.9795	19.9723	19.8153	19.3347	18.7892	18.3619 (90)
Living area fraction									LA = Living area / (4) =			0.1283 (91)
MIT	18.4970	18.6816	19.0030	19.4439	19.8193	20.0456	20.1057	20.0968	19.9328	19.4483	18.9025	18.4755 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4970	18.6816	19.0030	19.4439	19.8193	20.0456	20.1057	20.0968	19.9328	19.4483	18.9025	18.4755 (93)

8. Space heating requirement

Utilisation	0.9939	0.9883	0.9742	0.9327	0.8349	0.6610	0.4808	0.5479	0.8126	0.9580	0.9891	0.9951 (94)
Useful gains	502.6202	584.1492	664.1095	733.8438	722.9018	570.0659	393.7515	406.5907	534.2056	537.9411	489.9271	474.3132 (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	1697.8146	1643.7579	1487.3683	1238.9117	951.7961	631.4403	406.5015	427.7890	679.1998	1037.2538	1390.0996	1689.6241 (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	889.2246	712.0571	612.5046	363.6488	170.2974	0.0000	0.0000	0.0000	0.0000	371.4886	648.1242	904.1913 (98)
Space heating												4671.5365 (98)
Space heating per m2										(98) / (4) =		44.7294 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1089.9694	858.0610	879.4608	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8034	0.8710	0.8350	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	875.6651	747.3677	734.3097	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1098.4703	1046.5221	962.5909	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	160.4198	222.5709	169.8412	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling Cooled fraction												552.8318	(104)
Intermittency factor (Table 10b)												1.0000	(105)
EC = cooled area / (4) =													
0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.1049	55.6427	42.4603	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling Space cooling per m2												138.2080	(107)
Energy for space heating												1.3233	(108)
Energy for space cooling												44.7294	(99)
Total												1.3233	(108)
Dwelling Fabric Energy Efficiency (DFEE)												46.0527	(109)
												46.1	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	36.1000 (1b)	x 2.3100 (2b)	= 83.3910 (1b) - (3b)
First floor	36.1000 (1c)	x 2.5500 (2c)	= 92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	x 2.3500 (2d)	= 75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.2100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans - (6a)+(6b)+(7a)+(7b)+(7c) -					Air changes per hour
Pressure test					40.0000 / (5) = 0.1592 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4092 (18)
Shelter factor					2 (19)
Infiltration rate adjusted to include shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
					(21) = (18) x (20) = 0.3478 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4435	0.4348	0.4261	0.3826	0.3739	0.3305	0.3305	0.3218	0.3478	0.3739	0.3913	0.4087 (22b)
Effective ac	0.5983	0.5945	0.5908	0.5732	0.5699	0.5546	0.5546	0.5518	0.5605	0.5699	0.5766	0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.9700	1.0000	1.9700		(26)
TER Opening Type (Uw = 1.40)			12.0400	1.3258	15.9621		(27)
TER Room Window (Uw = 1.70)			1.3500	1.5918	2.1489		(27a)
150mm Platinum			36.1000	0.1300	4.6930		(28a)
50mm A. Platinum	106.2200	13.0400	93.1800	0.1800	16.7724		(29a)
Dormer wall	4.6500	0.9700	3.6800	0.1800	0.6624		(29a)
Wall to Roofspace	5.2700		5.2700	0.1800	0.9486		(29a)
Ceiling to I-Roof	16.6600		16.6600	0.1300	2.1658		(30)
Ceiling to Roofspace	3.8700		3.8700	0.1300	0.5031		(30)
Dormer roof	1.8700		1.8700	0.1300	0.2431		(30)
I-Roof	17.2700	1.3500	15.9200	0.1300	2.0696		(30)
Total net area of external elements Aum(A, m2)			191.9100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 48.1390		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0228 (36)
Total fabric heat loss							(33) + (36) = 59.1618 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	49.6026	49.2860	48.9757	47.5181	47.2454	45.9759	45.9759	45.7408	46.4649	47.2454	47.7971	48.3738 (38)
Average - Sum(39)m / 12 -	108.7644	108.4478	108.1375	106.6799	106.4072	105.1377	105.1377	104.9026	105.6267	106.4072	106.9589	107.5356 (39)
												106.6786 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0414	1.0384	1.0354	1.0214	1.0188	1.0067	1.0067	1.0044	1.0114	1.0188	1.0241	1.0296 (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												2.7770 (42)
Average daily hot water use (litres/day)												100.1538 (43)
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	94.1446	98.1507	102.1569	106.1630	110.1692 (44)
Energy conte	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1575.8093 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water storage loss:																					
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	34.7178	30.3644	31.3333	27.3171	26.2115	22.6185	20.9594	24.0512	24.3384	28.3641	30.9616	33.6223	65)								

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

Metabolic gains (Table 5), Watts													
(66)m	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.5604	22.7025	18.4629	13.9776	10.4484	8.8210	9.5314	12.3893	16.6289	21.1142	24.6433	26.2708	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943	68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	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)	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	71)
Water heating gains (Table 5)	46.6637	45.1851	42.1147	37.9405	35.2304	31.4146	28.1712	32.3268	33.8034	38.1238	43.0022	45.1913	72)
Total internal gains	400.1913	398.5873	384.3918	361.0740	336.3313	313.4973	299.3463	303.6275	316.2290	339.6930	366.6042	387.8113	73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 5a	Specific data	Specific data	factor	W						
		W/m2	or Table 5b	or Table 5c	Table 5d							
Southeast	4.4100	36.7938	0.6300	0.7000	0.7700	49.5890 (77)						
Southwest	1.0200	36.7938	0.6300	0.7000	0.7700	11.4696 (79)						
Northwest	6.6100	11.2829	0.6300	0.7000	0.7700	22.7927 (81)						
Northwest	1.3500	17.0692	0.6300	0.7000	1.0000	9.1459 (82)						
Solar gains	92.9972	169.4242	261.2928	373.5255	464.0685	480.8790	455.2212	384.5431	299.6415	195.1769	113.3899	78.2945 (83)
Total gains	493.1886	568.0114	645.6846	734.5995	800.3998	794.3764	754.5675	688.1705	615.8705	534.8700	479.9941	466.1058 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	66.6834	66.8781	67.0700	67.9864	68.1606	68.9836	68.9836	69.1382	68.6643	68.1606	67.8090	67.4454	
alpha	5.4456	5.4585	5.4713	5.5324	5.5440	5.5989	5.5989	5.6092	5.5776	5.5440	5.5206	5.4964	
util living area	0.9994	0.9985	0.9954	0.9805	0.9214	0.7702	0.5971	0.6696	0.9095	0.9907	0.9987	0.9996 (86)	
MIT	19.7859	19.9180	20.1502	20.4746	20.7678	20.9436	20.9889	20.9799	20.8444	20.4687	20.0729	19.7674 (87)	
Th 2	20.0490	20.0515	20.0539	20.0655	20.0677	20.0778	20.0778	20.0796	20.0739	20.0677	20.0633	20.0587 (88)	
util rest of house	0.9992	0.9980	0.9937	0.9724	0.8885	0.6876	0.4802	0.5511	0.8581	0.9858	0.9981	0.9994 (89)	
MIT 2	18.9296	19.0636	19.2971	19.6264	19.9025	20.0503	20.0747	20.0734	19.9793	19.6253	19.2281	18.9191 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	19.0395	19.1732	19.4065	19.7353	20.0136	20.1649	20.1920	20.1897	20.0903	19.7335	19.3365	19.0279 (92)	
Temperature adjustment													
adjusted MIT	19.0395	19.1732	19.4065	19.7353	20.0136	20.1649	20.1920	20.1897	20.0903	19.7335	19.3365	19.0279 (93)	

8. Space heating requirement

Utilisation	0.9989	0.9973	0.9920	0.9687	0.8862	0.6961	0.4953	0.5661	0.8592	0.9833	0.9975	0.9992 (94)
Useful gains	492.6318	566.4982	640.5365	711.6048	709.3108	552.9990	373.7019	389.6057	529.1449	525.9158	478.7961	465.7233 (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	1603.1323	1547.8967	1395.6806	1155.9055	884.6223	585.0848	377.6568	397.5495	632.7328	971.8718	1308.0039	1594.5300 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	826.2123	659.4998	561.8273	319.8965	130.4318	0.0000	0.0000	0.0000	0.0000	331.7913	597.6056	839.8322 (98)
Space heating												
Space heating per m2												(98) / (4) =
												40.8569 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	988.2944	778.0190	797.2599	0.0000	0.0000	0.0000	0.0000	(100)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8623	0.9261	0.8957	0.0000	0.0000	0.0000	0.0000	(101)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	852.2180	720.4869	714.1303	0.0000	0.0000	0.0000	0.0000	(102)	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1021.9944	974.1977	901.7741	0.0000	0.0000	0.0000	0.0000	(103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)	
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	122.2390	188.7608	139.6070	0.0000	0.0000	0.0000	0.0000	(104)	
Cooled fraction												450.6068	(104)	
Intermittency factor (Table 10b)												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	30.5598	47.1902	34.9017	0.0000	0.0000	0.0000	0.0000	(107)	
Space cooling												112.6517	(107)	
Space cooling per m2												1.0786	(108)	
Energy for space heating												40.8569	(99)	
Energy for space cooling												1.0786	(108)	
Total												41.9355	(109)	
Target Fabric Energy Efficiency (TFEE)												48.2	(109)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Kingsville Mid-Terrace			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 020, Chipping Lane , Longridge , PR3				
SAP Rating	86 B	DER	14.23	TER	15.03
Environmental	88 B	% DER<TER	5.31		
CO₂ Emissions (t/year)	1.30	DFEE	36.70	TFEE	40.33
General Requirements Compliance	Pass	% DFEE<TFEE	9.02		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Mid-Terrace House, total floor area 104 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) 15.03 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.23 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)40.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)36.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.30 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.17 (max. 0.20)	0.19 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.90 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 35

Combi boiler

Efficiency: 89.6% SEDBUK2009

Minimum: 88.0%

OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

Minimum

75%

OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

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

OK

Based on:

Overshading:

Average

Windows facing South East:

4.41 m², No overhang

Windows facing North West:

6.61 m², No overhang

Air change rate:

4.00 ach

Blinds/curtains:

None

10 Key features

External wall U-value

0.12 W/m²K

Party wall U-value

0.00 W/m²K

Roof U-value

0.12 W/m²K

Floor U-value

0.12 W/m²K

Door U-value

1.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	36.1000 (1b)	x 2.3100 (2b)	= 83.3910 (1b) - (3b)
First floor	36.1000 (1c)	x 2.5500 (2c)	= 92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	x 2.3500 (2d)	= 75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.2100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans - (6a)+(6b)+(7a)+(7b)+(7c) -					Air changes per hour							
Pressure test					40.0000 / (5) =	0.1592 (8)						
Measured/design AP50					Yes	5.0100						
Infiltration rate						0.4097 (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) =		0.3483 (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	0.4440	0.4353	0.4266	0.3831	0.3744	0.3309	0.3309	0.3221	0.3483	0.3744	0.3918	0.4092 (22b)
Effective ac	0.5986	0.5948	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5768	0.5837 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			11.0200	1.3347	14.7086		(27)					
Opening Type 7 (Uw = 1.90)			1.3500	1.7658	2.3838		(27a)					
150mm Platinium			36.1000	0.1200	4.3320		(28a)					
50mm A. Platinium	43.6500	12.0200	31.6300	0.2700	8.5401		(29a)					
Dormer wall	4.6500	0.9700	3.6800	0.3000	1.1040		(29a)					
Wall to Roofspace	5.2700		5.2700	0.1200	0.6324		(29a)					
Ceiling to I-Roof	16.6600		16.6600	0.1900	3.1654		(30)					
Ceiling to Roofspace	3.8700		3.8700	0.1200	0.4644		(30)					
Dormer roof	1.8700		1.8700	0.1700	0.3179		(30)					
I-Roof	17.2700	1.3500	15.9200	0.1600	2.5472		(30)					
Total net area of external elements Aum(A, m2)			129.3400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		40.1659 (33)					
E-WM-22			125.1400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP - Cm / TFA) in kJ/m2K							195.4140 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1427 (36)					
Total fabric heat loss							(33) + (36) = 50.3086 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 49.6225	Feb 49.3051	Mar 48.9941	Apr 47.5329	May 47.2596	Jun 45.9870	Jul 45.9870	Aug 45.7513	Sep 46.4772	Oct 47.2596	Nov 47.8126	Dec 48.3908 (38)
Heat transfer coeff	99.9311	99.6137	99.3026	97.8415	97.5681	96.2955	96.2955	96.0599	96.7857	97.5681	98.1212	98.6993 (39)
Average - Sum(39)m / 12 =												97.8402 (39)
HLP	Jan 0.9568	Feb 0.9538	Mar 0.9508	Apr 0.9368	May 0.9342	Jun 0.9220	Jul 0.9220	Aug 0.9198	Sep 0.9267	Oct 0.9342	Nov 0.9395	Dec 0.9450 (40)
HLP (average)												0.9368 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7770 (42)											
Average daily hot water use (litres/day)	100.1538 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	91.1446	98.1507	102.1569	106.1630	110.1692 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)
Distribution loss (46)m = 0.15 x (45)m	24.5067	21.4337	22.1176	19.2827	18.5022	15.9660	14.7948	16.9773	17.1801	20.0217	21.8553	23.7334 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.1487	12.7682	14.1104	13.6156	14.0353	13.5431	13.9699	14.0123	13.5826	14.0769	13.6625	14.1363 (61)
Total heat required for water heating calculated for each month	177.5264	155.6594	161.5614	142.1669	137.3833	119.9830	112.6022	127.1943	128.1163	147.5549	159.3642	172.3589 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	177.5264	155.6594	161.5614	142.1669	137.3833	119.9830	112.6022	127.1943	128.1163	147.5549	159.3642	172.3589 (64)
Heat gains from water heating, kWh/month	57.8603	50.7034	52.5550	46.1472	44.5220	38.7771	36.2877	41.1361	41.4781	47.9007	51.8614	56.1431 (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	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0038	23.0963	18.7832	14.2201	10.6297	8.9740	9.6967	12.6042	16.9173	21.4804	25.0708	26.7265 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801 (71)
Water heating gains (Table 5)	77.7692	75.4515	70.6385	64.0933	59.8414	53.8570	48.7738	55.2904	57.6085	64.3826	72.0298	75.4611 (72)
Total internal gains	434.7403	432.2474	416.2359	390.4693	364.1235	339.0928	323.1143	329.8060	343.3226	369.3182	399.0592	421.5369 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast	4.4100	36.7938	0.7100	0.7000	0.7700	55.8860 (77)						
Northwest	6.6100	11.2829	0.7100	0.7000	0.7700	25.6870 (81)						
Northwest	1.3500	17.0692	0.7600	0.7000	1.0000	11.0332 (82)						
Solar gains	92.6062	170.4304	267.1565	388.3861	487.6997	507.4267	479.5301	401.8272	308.5398	197.4944	113.2250	77.7642 (83)
Total gains	527.3465	602.6778	683.3925	778.8554	851.8233	846.5195	802.6444	731.6332	651.8624	566.8126	512.2842	499.3011 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.7309	56.9116	57.0899	57.9425	58.1048	58.8727	58.8727	59.0171	58.5745	58.1048	57.7773	57.4389	
alpha	4.7821	4.7941	4.8060	4.8628	4.8737	4.9248	4.9248	4.9345	4.9050	4.8737	4.8518	4.8293	
util living area	0.9972	0.9943	0.9852	0.9512	0.8549	0.6791	0.5169	0.5830	0.8405	0.9733	0.9946	0.9979	(86)
MIT	19.7026	19.8589	20.1286	20.4947	20.7955	20.9526	20.9899	20.9825	20.8629	20.4717	20.0263	19.6798	(87)
Th 2	20.1195	20.1220	20.1245	20.1363	20.1385	20.1488	20.1488	20.1507	20.1449	20.1395	20.1341	20.1294	(88)
util rest of house	0.9965	0.9927	0.9811	0.9371	0.8153	0.6054	0.4221	0.4848	0.7828	0.9631	0.9929	0.9973	(89)
MIT 2	18.3649	18.5947	18.9883	19.5192	19.9233	20.1122	20.1439	20.1413	20.0197	19.4955	18.8483	18.3386	(90)
Living area fraction									FLA = Living area / (4)				0.1283 (91)
MIT	18.5365	18.7569	19.1346	19.6443	20.0352	20.2200	20.2524	20.2492	20.1279	19.6208	18.9995	18.5106	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.3865	18.6069	18.9846	19.4943	19.8852	20.0700	20.1024	20.0992	19.9779	19.4708	18.8495	18.3606	(93)

8. Space heating requirement

Utilisation	0.9943	0.9888	0.9735	0.9238	0.8019	0.5981	0.4168	0.4785	0.7696	0.9522	0.9890	0.9955	(94)
Useful gains	524.3222	595.9439	665.3021	719.5207	683.0952	506.2712	334.5188	350.0955	501.6723	539.6977	506.6745	497.0694	(95)
Ext temp.	4.3000	4.9000	6.6000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1407.6832	1365.3975	1239.7525	1036.5663	798.6114	526.7366	337.2691	355.3465	568.8957	865.5040	1152.8718	1397.6457	(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	657.2206	517.0728	427.3910	228.2728	85.9440	0.0000	0.0000	0.0000	0.0000	242.3999	465.2621	670.0288	(98)
Space heating													3293.5920 (98)
Space heating per m2													(98) / (4) = 31.5357 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3639.3281 (211)
Space heating requirement	657.2206	517.0728	427.3910	228.2728	85.9440	0.0000	0.0000	0.0000	0.0000	242.3999	465.2621	670.0288	(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)	726.2106	571.3512	472.2553	252.2351	94.9657	0.0000	0.0000	0.0000	0.0000	267.8452	514.1017	740.3633	(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	177.5264	155.6594	161.5614	142.1669	137.3833	119.9830	112.6022	127.1943	128.1163	147.5549	159.3642	172.3589	(64)
Efficiency of water heater (217)m	89.8000	89.7389	89.5991	89.2446	88.5043	87.3000	87.3000	87.3000	87.3000	89.2619	89.6615	87.3000	(216)
Fuel for water heating, kWh/month	197.6909	173.4581	180.3159	159.3004	155.2278	137.4376	128.9830	145.6979	146.7541	165.3055	177.7398	191.8802	(219)
Water heating fuel used													1959.7912 (219)
Annual totals kWh/year													
Space heating fuel - main system													3639.3281 (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)													459.2346 (232)
Total delivered energy for all uses													6133.3540 (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	3639.3281	0.2160	786.0949	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1959.7912	0.2160	423.3149	(264)
Space and water heating			1209.4098	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	459.2346	0.5190	238.3428	(268)
Total CO2, kg/year			1486.6776	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2300	(273)

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

DER			14.2300	ZC1
Total Floor Area		TFA	104.4400	
Assumed number of occupants		N	2.7770	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			14.9400	ZC2
CO2 emissions from cooking, equation (L16)			1.7776	ZC3
Total CO2 emissions			30.9476	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			30.9476	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 (m2)	Storey height (m)	Volume (m3)
Ground floor	36.1000 (1b)	2.3100 (2b)	83.3910 (1b) - (3b)
First floor	36.1000 (1c)	2.5500 (2c)	92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	2.3500 (2d)	75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.2100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans - (6a)+(6b)+(7a)+(7b)+(7c) -				40.0000 / (5) =	0.1592 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate					0.4092 (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) =		0.3478 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4435	0.4348	0.4261	0.3826	0.3739	0.3305	0.3305	0.3218	0.3478	0.3739	0.3913	0.4087 (22b)
Effective ac	0.5983	0.5945	0.5908	0.5732	0.5699	0.5546	0.5546	0.5518	0.5605	0.5699	0.5766	0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.9700	1.0000	1.9700		(26)
TER Opening Type (Uw = 1.40)			11.0200	1.3258	14.6098		(27)
TER Room Window (Uw = 1.70)			1.3500	1.5918	2.1489		(27a)
150mm Platinum			36.1000	0.1300	4.6930		(28a)
50mm A. Platinum	43.6500	12.0200	31.6300	0.1800	5.6934		(29a)
Dormer wall	4.6500	0.9700	3.6800	0.1800	0.6624		(29a)
Wall to Roofspace	5.2700		5.2700	0.1800	0.9486		(29a)
Ceiling to I-Roof	16.6600		16.6600	0.1300	2.1658		(30)
Ceiling to Roofspace	3.8700		3.8700	0.1300	0.5031		(30)
Dormer roof	1.8700		1.8700	0.1300	0.2431		(30)
I-Roof	17.2700	1.3500	15.9200	0.1300	2.0696		(30)
Total net area of external elements Aum(A, m2)			129.3400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.7077		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6486 (36)
Total fabric heat loss							(33) + (36) = 45.3563 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	49.6026	49.2860	48.9757	47.5181	47.2454	45.9759	45.9759	45.7408	46.4649	47.2454	47.7971	48.3738 (38)
Average - Sum(39)m / 12 -	94.9589	94.6423	94.3320	92.8744	92.6017	91.3322	91.3322	91.0971	91.8212	92.6017	93.1534	93.7301 (39)
												92.8731 (39)
HLP	0.9092	0.9062	0.9032	0.8893	0.8866	0.8745	0.8745	0.8722	0.8792	0.8866	0.8919	0.8975 (40)
HLP (average)												0.8892 (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												2.7770 (42)
Average daily hot water use (litres/day)												100.1538 (43)
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	94.1446	98.1507	102.1569	106.1630	110.1692 (44)
Energy conte	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1575.8093 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.5067	21.4337	22.1176	19.2827	18.5022	15.9660	14.7948	16.9773	17.1801	20.0217	21.8553	23.7334	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	48.4031	47.9750	44.4518	45.9336	47.9750	48.4031	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	214.3366	188.9186	198.4098	176.9544	171.3231	150.8918	144.5658	161.1570	162.9368	184.4369	195.0167	209.1815	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	214.3366	188.9186	198.4098	176.9544	171.3231	150.8918	144.5658	161.1570	162.9368	184.4369	195.0167	209.1815	(64)
Heat gains from water heating, kWh/month	67.0628	59.0182	61.7672	54.8441	53.0070	46.5042	44.2786	49.6268	50.1832	57.1212	60.7746	65.3487	(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	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0038	23.0963	18.7832	14.2201	10.6297	8.9740	9.6967	12.6042	16.9173	21.4804	25.0708	26.7265	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	(71)
Water heating gains (Table 5)	90.1382	87.8247	83.0204	76.1723	71.2459	64.5892	59.5143	66.7026	69.6989	76.7758	84.4091	87.8343	(72)
Total internal gains	447.1093	444.6207	428.6178	402.5483	375.5280	349.8250	333.8547	341.2182	355.4131	381.7113	411.4386	433.9101	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	PF	Access factor Table 6d	Gains W					
Southeast	4.4100	36.7938	0.6300	0.7000	0.7700	49.5890 (77)						
Northwest	6.6100	11.2829	0.6300	0.7000	0.7700	22.7927 (81)						
Northwest	1.3500	17.0692	0.6300	0.7000	1.0000	9.1459 (82)						
Solar gains	81.5276	149.8872	234.5615	340.4042	426.9699	444.0487	419.7128	352.0019	270.6972	173.5845	99.6520	68.4789 (83)
Total gains	528.6369	594.5079	663.1793	742.9525	802.4979	793.8737	753.5676	693.2201	626.1103	555.2958	511.0906	502.3891 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3781	76.6336	76.8857	78.0923	78.3223	79.4109	79.4109	79.6159	78.9880	78.3223	77.8584	77.3793	
alpha	6.0919	6.1089	6.1257	6.2062	6.2215	6.2941	6.2941	6.3077	6.2659	6.2215	6.1906	6.1586	
util living area	0.9992	0.9981	0.9939	0.9726	0.8900	0.7046	0.5285	0.5942	0.8674	0.9860	0.9981	0.9994	(86)
MIT	20.0053	20.1245	20.3327	20.6213	20.8612	20.9762	20.9966	20.9933	20.9144	20.6075	20.2595	19.9890	(87)
Th 2	20.1597	20.1622	20.1648	20.1766	20.1789	20.1892	20.1892	20.1912	20.1852	20.1789	20.1744	20.1697	(88)
util rest of house	0.9989	0.9974	0.9916	0.9623	0.8519	0.6282	0.4337	0.4951	0.8088	0.9790	0.9973	0.9992	(89)
MIT 2	18.8126	18.9887	19.2941	19.7171	20.0385	20.1729	20.1879	20.1882	20.1127	19.7038	19.1956	18.7962	(90)
Living area fraction	18.9656	19.1344	19.4273	19.8331	20.1440	20.2760	20.2916	20.2915	20.2156	19.8198	19.3321	18.9492	(91)
Temperature adjustment	18.9656	19.1344	19.4273	19.8331	20.1440	20.2760	20.2916	20.2915	20.2156	19.8198	19.3321	18.9492	(92)
adjusted MIT	18.9656	19.1344	19.4273	19.8331	20.1440	20.2760	20.2916	20.2915	20.2156	19.8198	19.3321	18.9492	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9983	0.9962	0.9889	0.9569	0.8501	0.6368	0.4459	0.5077	0.8113	0.9748	0.9961	0.9988	(94)
Ext temp.	527.7383	592.2571	655.8345	710.8988	682.1973	505.5191	335.9813	351.9625	507.9651	541.3091	509.1145	501.7612	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1392.6284	1347.1754	1219.4595	1015.4050	781.9317	518.3982	337.1646	354.5017	561.5383	853.7654	1139.4629	1382.4491	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating per m ²	643.4782	507.3051	419.3370	219.2444	74.2023	0.0000	0.0000	0.0000	0.0000	232.4675	453.8509	655.2318	(98)
												3205.1172 (98)	
												(98) / (4) = 30.6886 (99)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3431.6030 (211)
Space heating requirement	643.4782	507.3051	419.3370	219.2444	74.2023	0.0000	0.0000	0.0000	0.0000	232.4675	453.8509	655.2318	(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)	688.9488	543.1532	448.9689	234.7371	79.4458	0.0000	0.0000	0.0000	0.0000	248.8945	485.9217	701.5329	(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	214.3366	188.9186	198.4098	176.9544	171.3231	150.8918	144.5658	161.1570	162.9368	184.4369	195.0167	209.1815	(64)
Efficiency of water heater (217)m	87.6455	87.4165	86.8898	85.5918	83.1061	80.3000	80.3000	80.3000	80.3000	85.6349	87.1071	87.7297	(217)
Fuel for water heating, kWh/month	244.5494	216.1132	228.3464	206.7423	206.1497	187.9101	180.0321	200.6937	202.9101	215.3758	223.8815	238.4385	(219)
Water heating fuel used													2551.1428 (219)
Annual totals kWh/year													
Space heating fuel - main system													3431.6030 (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)													459.2346 (232)
Total delivered energy for all uses													6516.9804 (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	3431.6030	0.2160	741.2262	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2551.1428	0.2160	551.0468	(264)
Space and water heating			1292.2731	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	459.2346	0.5190	238.3428	(268)
Total CO2, kg/m2/year			1569.5409	(272)
Emissions per m2 for space and water heating			12.3734	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2821	(272b)
Emissions per m2 for pumps and fans			0.3727	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.3734 * 1.00) + 2.2821 + 0.3727, rounded to 2 d.p.			15.0300	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	36.1000 (1b)	x 2.3100 (2b)	= 83.3910 (1b) - (3b)
First floor	36.1000 (1c)	x 2.5500 (2c)	= 92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	x 2.3500 (2d)	= 75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.2100 (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) -					Air changes per hour							
Pressure test					40.0000 / (5) =	0.1592 (8)						
Measured/design AP50					Yes	5.0100						
Infiltration rate						0.4097 (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) =		0.3483 (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	0.4440	0.4353	0.4266	0.3831	0.3744	0.3309	0.3309	0.3221	0.3483	0.3744	0.3918	0.4092 (22b)
Effective ac	0.5986	0.5948	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5768	0.5837 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			11.0200	1.3347	14.7086		(27)					
Opening Type 7 (Uw = 1.90)			1.3500	1.7658	2.3838		(27a)					
150mm Platinium			36.1000	0.1200	4.3320		(28a)					
50mm A. Platinium	43.6500	12.0200	31.6300	0.2700	8.5401		(29a)					
Dormer wall	4.6500	0.9700	3.6800	0.3000	1.1040		(29a)					
Wall to Roofspace	5.2700		5.2700	0.1200	0.6324		(29a)					
Ceiling to I-Roof	16.6600		16.6600	0.1900	3.1654		(30)					
Ceiling to Roofspace	3.8700		3.8700	0.1200	0.4644		(30)					
Dormer roof	1.8700		1.8700	0.1700	0.3179		(30)					
I-Roof	17.2700	1.3500	15.9200	0.1600	2.5472		(30)					
Total net area of external elements Aum(A, m ²)			129.3400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	40.1659	(33)					
E-WM-22			125.1400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP - Cm / TFA) in kJ/m ² K							195.4140 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.1427 (36)					
Total fabric heat loss						(33) + (36) =	50.3086 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 49.6225	Feb 49.3051	Mar 48.9941	Apr 47.5329	May 47.2596	Jun 45.9870	Jul 45.9870	Aug 45.7513	Sep 46.4772	Oct 47.2596	Nov 47.8126	Dec 48.3908 (38)
Heat transfer coeff	99.9311	99.6137	99.3026	97.8415	97.5681	96.2955	96.2955	96.0599	96.7857	97.5681	98.1212	98.6993 (39)
Average - Sum(39)m / 12 =												97.8402 (39)
HLP	Jan 0.9568	Feb 0.9538	Mar 0.9508	Apr 0.9368	May 0.9342	Jun 0.9220	Jul 0.9220	Aug 0.9198	Sep 0.9267	Oct 0.9342	Nov 0.9395	Dec 0.9450 (40)
HLP (average)												0.9368 (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												2.7770 (42)
Average daily hot water use (litres/day)												100.1538 (43)
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	94.1446	98.1507	102.1569	106.1630	110.1692 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)
Energy content (annual)										Total -	Sum(45)m -	1575.8093 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	34.7178	30.3644	31.3333	27.3171	26.2115	22.6185	20.9594	24.0512	24.3384	28.3641	30.9616	33.6223 (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	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0038	23.0963	18.7832	14.2201	10.6297	8.9740	9.6967	12.6042	16.9173	21.4804	25.0708	26.7265 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850 (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)	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801 (71)
Water heating gains (Table 5)	46.6637	45.1851	42.1147	37.9405	35.2304	31.4146	28.1712	32.3268	33.8034	38.1238	43.0022	45.1913 (72)
Total internal gains	400.6348	398.9811	384.7121	361.3165	336.5125	313.6503	299.5116	303.8424	316.5175	340.0593	367.0317	388.2670 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	α Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast	4.4100	36.7938	0.7100	0.7000	0.7700	55.8860 (77)						
Northwest	6.6100	11.2829	0.7100	0.7000	0.7700	25.6870 (81)						
Northwest	1.3500	17.0692	0.7600	0.7000	1.0000	11.0332 (82)						
Solar gains	92.6062	170.4304	267.1565	388.3861	487.6997	507.4267	479.5301	401.8272	308.5398	197.4944	113.2250	77.7642 (83)
Total gains	493.2410	569.4114	651.8686	749.7025	824.2123	821.0770	779.0418	705.6696	625.0573	537.5537	480.2567	466.0312 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.7309	56.9116	57.0899	57.9425	58.1048	58.8727	58.8727	59.0171	58.5745	58.1048	57.7773	57.4389
alpha	4.7821	4.7941	4.8060	4.8628	4.8737	4.9248	4.9248	4.9345	4.9050	4.8737	4.8518	4.8293
util living area	0.9979	0.9955	0.9877	0.9573	0.8670	0.6948	0.5312	0.6014	0.8569	0.9782	0.9959	0.9984 (86)
MIT	19.6644	19.8221	20.0952	20.4684	20.7800	20.9476	20.9887	20.9800	20.8489	20.4422	19.9907	19.6423 (87)
Th 2	20.1195	20.1220	20.1245	20.1363	20.1385	20.1488	20.1488	20.1507	20.1449	20.1385	20.1341	20.1294 (88)
util rest of house	0.9974	0.9943	0.9843	0.9447	0.8293	0.6210	0.4344	0.5013	0.8021	0.9697	0.9946	0.9980 (89)
MIT 2	18.8834	19.0427	19.3160	19.6903	19.9790	20.1209	20.1450	20.1433	20.0492	19.6714	19.2209	18.8693 (90)
Living area fraction									FLA = Living area / (4) =			0.1283 (91)
MIT	18.9836	19.1427	19.4159	19.7901	20.0818	20.2270	20.2532	20.2506	20.1518	19.7703	19.3197	18.9685 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9836	19.1427	19.4159	19.7901	20.0818	20.2270	20.2532	20.2506	20.1518	19.7703	19.3197	18.9685 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9964	0.9924	0.9806	0.9385	0.8265	0.6282	0.4466	0.5136	0.8026	0.9649	0.9929	0.9972 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (95)
Heat loss rate W	1467.3519	1410.7709	1282.5873	1065.5060	817.7941	541.8517	351.7916	369.8910	585.7243	894.7274	1199.0092	1457.6379 (96)
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	726.0669	573.6627	478.6626	260.5557	101.6245	0.0000	0.0000	0.0000	0.0000	279.7700	519.9608	738.7140 (98)
Space heating												3679.0172 (98)
Space heating per m2										(98) / (4) =		35.2261 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	905.1781	712.5870	730.0550	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8866	0.9375	0.9117	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	802.5103	668.0222	665.6080	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1050.3379	1000.1619	920.2632	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	178.4359	247.1119	189.4635	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												615.0112 (104)
Intermittency factor (Table 10b)												FC = cooled area / (4) =
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	44.6090	61.7780	47.3659	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling												0.0000 (107)
Space cooling per m2												153.7528 (107)
Energy for space heating												1.4722 (108)
Energy for space cooling												35.2261 (99)
Total												1.4722 (108)
Dwelling Fabric Energy Efficiency (DFEE)												36.6983 (109)
												36.7 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	36.1000 (1b)	x 2.3100 (2b)	= 83.3910 (1b) - (3b)
First floor	36.1000 (1c)	x 2.5500 (2c)	= 92.0550 (1c) - (3c)
Second floor	32.2400 (1d)	x 2.3500 (2d)	= 75.7640 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.2100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans - (6a)+(6b)+(7a)+(7b)+(7c) -					Air changes per hour							
Pressure test					40.0000 / (5) =	0.1592 (8)						
Measured/design AP50					Yes	5.0000						
Infiltration rate						0.4092 (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) =		0.3478 (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	0.4435	0.4348	0.4261	0.3826	0.3739	0.3305	0.3305	0.3218	0.3478	0.3739	0.3913	0.4087 (22b)
Effective ac	0.5983	0.5945	0.5908	0.5732	0.5699	0.5546	0.5546	0.5518	0.5605	0.5699	0.5766	0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			11.0200	1.3258	14.6098		(27)					
TER Room Window (Uw = 1.70)			1.3500	1.5918	2.1489		(27a)					
150mm Platinum			36.1000	0.1300	4.6930		(28a)					
50mm A. Platinum	43.6500	12.0200	31.6300	0.1800	5.6934		(29a)					
Dormer wall	4.6500	0.9700	3.6800	0.1800	0.6624		(29a)					
Wall to Roofspace	5.2700		5.2700	0.1800	0.9486		(29a)					
Ceiling to I-Roof	16.6600		16.6600	0.1300	2.1658		(30)					
Ceiling to Roofspace	3.8700		3.8700	0.1300	0.5031		(30)					
Dormer roof	1.8700		1.8700	0.1300	0.2431		(30)					
I-Roof	17.2700	1.3500	15.9200	0.1300	2.0696		(30)					
Total net area of external elements Aum(A, m2)			129.3400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.7077	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6486 (36)					
Total fabric heat loss							(33) + (36) = 45.3563 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 49.6026	Feb 49.2860	Mar 48.9757	Apr 47.5181	May 47.2454	Jun 45.9759	Jul 45.9759	Aug 45.7408	Sep 46.4649	Oct 47.2454	Nov 47.7971	Dec 48.3738 (38)
Heat transfer coeff	94.9589	94.6423	94.3320	92.8744	92.6017	91.3322	91.3322	91.0971	91.8212	92.6017	93.1534	93.7301 (39)
Average - Sum(39)m / 12 -												92.8731 (39)
HLP	Jan 0.9092	Feb 0.9062	Mar 0.9032	Apr 0.8893	May 0.8866	Jun 0.8745	Jul 0.8745	Aug 0.8722	Sep 0.8792	Oct 0.8866	Nov 0.8919	Dec 0.8975 (40)
HLP (average)												0.8892 (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												2.7770 (42)
Average daily hot water use (litres/day)												100.1538 (43)
Daily hot water use	110.1692	106.1630	102.1569	98.1507	94.1446	90.1384	90.1384	94.1446	98.1507	102.1569	106.1630	110.1692 (44)
Energy conte	163.3777	142.8912	147.4509	128.5513	123.3480	106.4400	98.6323	113.1820	114.5337	133.4780	145.7017	158.2226 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1575.8093 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water storage loss:																					
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	34.7178	30.3644	31.3333	27.3171	26.2115	22.6185	20.9594	24.0512	24.3384	28.3641	30.9616	33.6223	65								

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

Metabolic gains (Table 5), Watts													
(66)m	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501	138.8501
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0038	23.0963	18.7832	14.2201	10.6297	8.9740	6.9667	12.6042	16.9173	21.4804	25.0708	26.7265	67
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.3123	266.0447	259.1592	244.5009	225.9974	208.6067	196.9887	194.2563	201.1418	215.8001	234.3036	251.6943	68
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	36.8850	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)	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	-111.0801	71
Water heating gains (Table b)	46.6637	45.1851	42.1147	37.9405	35.2304	31.4146	28.1712	32.3268	33.8034	38.1238	43.0022	45.1913	72
Total internal gains	400.6348	398.9811	384.7121	361.3165	336.5125	313.6503	299.5116	303.8424	316.5175	340.0593	367.0317	388.2670	73

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 5a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Southeast	4.4100	36.7938	0.6300	0.7000	0.7700	49.5890 (77)							
Northwest	6.6100	11.2829	0.6300	0.7000	0.7700	22.7927 (81)							
Northwest	1.3500	17.0692	0.6300	0.7000	1.0000	9.1459 (82)							
Solar gains	81.5276	149.8872	234.5615	340.4042	426.9699	444.0487	419.7128	352.0019	270.6972	173.5845	99.6520	68.4789	83
Total gains	482.1624	548.8683	619.2736	701.7206	763.4824	757.6990	719.2245	655.8443	587.2147	513.6438	466.6837	456.7460	84

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3781	76.6336	76.8857	78.0923	78.3223	79.4109	79.4109	79.6159	78.9880	78.3223	77.8584	77.3793	
alpha	6.0919	6.1089	6.1257	6.2062	6.2215	6.2941	6.2941	6.3077	6.2659	6.2215	6.1906	6.1586	
util living area	0.9995	0.9987	0.9957	0.9791	0.9077	0.7309	0.5523	0.6247	0.8929	0.9906	0.9988	0.9997	86
MIT	19.9618	20.0820	20.2927	20.5877	20.8411	20.9709	20.9956	20.9912	20.8966	20.5709	20.2181	19.9461	87
Th 2	20.1597	20.1622	20.1648	20.1766	20.1789	20.1892	20.1892	20.1912	20.1852	20.1789	20.1744	20.1697	88
util rest of house	0.9993	0.9983	0.9941	0.9709	0.8733	0.6543	0.4540	0.5222	0.8400	0.9857	0.9984	0.9995	89
MIT 2	19.1965	19.3186	19.5307	19.8311	20.0670	20.1753	20.1880	20.1884	20.1233	19.8192	19.4648	19.1891	90
Living area fraction													fLA = Living area / (4) = 0.1283 (91)
MIT	19.2947	19.4166	19.6285	19.9282	20.1663	20.2774	20.2916	20.2914	20.2225	19.9157	19.5614	19.2862	92
Temperature adjustment													0.0000
adjusted MIT	19.2947	19.4166	19.6285	19.9282	20.1663	20.2774	20.2916	20.2914	20.2225	19.9157	19.5614	19.2862	93

8. Space heating requirement

Utilisation	0.9991	0.9978	0.9928	0.9678	0.8727	0.6632	0.4667	0.5353	0.8429	0.9835	0.9979	0.9991	94
Useful gains	481.7269	547.6540	614.8053	679.1011	666.2747	502.4822	335.6388	351.0975	494.9543	505.1880	465.6919	456.4523	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	1423.8757	1373.8797	1238.4379	1024.2344	783.9969	518.5298	337.1663	354.4969	562.1784	862.6482	1160.8250	1414.0327	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	700.9587	555.2237	463.9827	248.4960	87.5853	0.0000	0.0000	0.0000	0.0000	265.9504	500.4959	712.4398	98
Space heating													3535.1324 (98)
Space heating per m2													(98) / (4) = 33.8485 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
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	858.5230	675.8585	692.3383	0.0000	0.0000	0.0000	0.0000	100

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9127	0.9600	0.9388	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	783.6027	648.8164	649.9688	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	979.3285	933.1078	864.2763	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	140.9225	211.5128	159.4448	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												511.8801 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	35.2306	52.8782	39.8612	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												127.9700 (107)
Space cooling per m2												1.2253 (108)
Energy for space heating												33.8485 (99)
Energy for space cooling												1.2253 (108)
Total												35.0737 (109)
Target Fabric Energy Efficiency (TFEE)												40.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	Lutterworth Detached			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	2 FOXGLOVE DRIVE, LONGRIDGE, PRESTON, PR3 2RP				
SAP Rating	84 B	DER	17.52	TER	18.27
Environmental	86 B	% DER<TER	4.10		
CO₂ Emissions (t/year)	1.46	DFEE	50.06	TFEE	54.86
General Requirements Compliance	Pass	% DFEE<TFEE	8.75		
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 92 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) 18.27 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 50.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.41 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.12 (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 East: 4.47 m², No overhang
Windows facing South East: 4.25 m², No overhang
Windows facing West: 2.78 m², No overhang
Windows facing North West: 3.44 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 0.037 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.7700 (1b)	x 2.3100 (2b)	= 105.7287 (1b) - (3b)
First floor	45.7700 (1c)	x 2.5600 (2c)	= 117.1712 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 222.8999 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					4 * 10 = 40.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1795 (8)							
Pressure test					Yes							
Measured/design AP50					4.1200							
Infiltration rate					0.3855 (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) = 0.3276 (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	0.4177	0.4095	0.4014	0.3604	0.3522	0.3113	0.3113	0.3031	0.3276	0.3522	0.3686	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5537	0.5620	0.5679	0.5741 (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)			14.9400	1.3347	19.9407		(27)					
Opening Type 11			1.9700	1.0000	1.9700		(26)					
150mm TE Platinum GF			45.7700	0.1500	6.8655		(28a)					
50mm Alreflex Plat	135.2400	16.9100	118.3300	0.2700	31.9491		(29a)					
400mm mineral	45.7700		45.7700	0.1100	5.0347		(30)					
Total net area of external elements Aum(A, m ²)			226.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 65.7600		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.2000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4596 (36)					
Total fabric heat loss							(33) + (36) = 74.2197 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.1964	Feb 42.9472	Mar 42.7029	Apr 41.5555	May 41.3409	Jun 40.3415	Jul 40.3415	Aug 40.1565	Sep 40.7265	Oct 41.3409	Nov 41.7751	Dec 42.2292 (38)
Heat transfer coeff	117.4161	117.1668	116.9226	115.7752	115.5605	114.5612	114.5612	114.3761	114.9461	115.5605	115.9948	116.4488 (39)
Average = Sum(39)m / 12 =												115.7742 (39)
HLP	Jan 1.2827	Feb 1.2800	Mar 1.2773	Apr 1.2647	May 1.2624	Jun 1.2515	Jul 1.2515	Aug 1.2495	Sep 1.2557	Oct 1.2624	Nov 1.2671	Dec 1.2721 (40)
HLP (average)												1.2647 (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												2.6462 (42)
Average daily hot water use (litres/day)												97.0477 (43)
Daily hot water use	106.7524	102.8705	98.9886	95.1067	91.2248	87.3429	87.3429	91.2248	95.1067	98.9886	102.8705	106.7524 (44)
Energy conte	158.3108	138.4596	142.8779	124.5644	119.5225	103.1389	95.5733	109.6718	110.9816	129.3384	141.1829	153.3155 (45)
Energy content (annual)												Total = Sum(45)m = 1526.9378 (45)
Distribution loss (46)m = 0.15 x (45)m	23.7466	20.7689	21.4317	18.6847	17.9284	15.4708	14.3360	16.4508	16.6472	19.4008	21.1774	22.9973 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month	14.1365	12.7576	14.0960	13.5971	14.0182	13.5290	13.9569	13.9967	13.5661	14.0638	13.6516	14.1245	14.1245	14.1245	(61)
Solar input	172.4473	151.2172	156.9739	138.1616	133.5408	116.6679	109.5302	123.6685	124.5477	143.4022	154.8346	167.4401	167.4401	167.4401	(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	172.4473	151.2172	156.9739	138.1616	133.5408	116.6679	109.5302	123.6685	124.5477	143.4022	154.8346	167.4401	167.4401	167.4401	(64)
	56.1725	49.2272	51.0309	44.8170	43.2458	37.6759	35.2674	39.9650	40.2929	46.5210	50.3562	54.5085	54.5085	54.5085	(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	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4104	19.9047	16.1876	12.2551	9.1608	7.7339	8.3568	10.8625	14.5796	18.5122	21.6064	23.0333	23.0333	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.8826	244.3925	238.0675	224.6021	207.6045	191.6292	180.9567	178.4467	184.7718	198.2372	215.2347	231.2101	231.2101	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	(71)
Water heating gains (Table b)	75.5006	73.2548	68.5899	62.2458	58.1261	52.3277	47.4024	53.7164	55.9624	62.5282	69.9392	73.2642	73.2642	(72)
Total internal gains	405.4869	403.2453	388.5383	364.7962	340.5847	317.3841	302.4091	308.7189	321.0071	344.9708	372.4736	393.2008	393.2008	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W								
East	4.4700	19.6403	0.7100	0.7000	0.7700	30.2374 (76)								
Southeast	4.2500	36.7938	0.7100	0.7000	0.7700	53.8584 (77)								
West	2.7800	19.6403	0.7100	0.7000	0.7700	18.8054 (80)								
Northwest	3.4400	11.2829	0.7100	0.7000	0.7700	13.3681 (81)								
Solar gains	116.2693	214.8901	332.5460	466.4729	564.8325	577.4138	549.8974	475.2652	379.4108	248.4860	142.4811	97.3390	97.3390	(83)
Total gains	521.7562	618.1354	721.0843	831.2691	905.4172	894.7979	852.3065	783.9841	700.4179	593.4567	514.9547	490.5398	490.5398	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	34.6931	34.7669	34.8396	35.1848	35.2502	35.5577	35.5577	35.6152	35.4386	35.2502	35.1182	34.9813	34.9813	
alpha	3.3129	3.3178	3.3226	3.3457	3.3500	3.3705	3.3705	3.3743	3.3626	3.3500	3.3412	3.3321	3.3321	
util living area	0.9908	0.9833	0.9656	0.9209	0.8312	0.6893	0.5457	0.6015	0.8162	0.9501	0.9849	0.9925	0.9925	(86)
MIT	18.9987	19.2266	19.6134	20.1154	20.5513	20.8374	20.9455	20.9237	20.6910	20.1113	19.4623	18.9579	18.9579	(87)
Th 2	19.8544	19.8566	19.8587	19.8685	19.8704	19.8790	19.8790	19.8806	19.8757	19.8704	19.8667	19.8627	19.8627	(88)
util rest of house	0.9887	0.9794	0.9572	0.9005	0.7860	0.6045	0.4247	0.4810	0.7497	0.9332	0.9807	0.9908	0.9908	(89)
MIT 2	17.1941	17.5265	18.0867	18.8056	19.3960	19.7484	19.8511	19.8377	19.5921	18.8146	17.8780	17.1397	17.1397	(90)
Living area fraction									FLA = Living area / (4) =			0.1792	0.1792	(91)
MIT	17.5174	17.8311	18.3602	19.0403	19.6030	19.9435	20.0472	20.0322	19.7890	19.0469	18.1618	17.4654	17.4654	(92)
Temperature adjustment												-0.1500	-0.1500	
adjusted MIT	17.3674	17.6811	18.2102	18.8903	19.4530	19.7935	19.8972	19.8822	19.6390	18.8969	18.0118	17.3154	17.3154	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9813	0.9681	0.9400	0.8777	0.7660	0.5972	0.4268	0.4812	0.7327	0.9128	0.9700	0.9845	0.9845	(94)
Ext temp.	512.0012	598.4328	677.8387	729.6381	693.5909	534.4104	363.7871	377.2597	513.2153	541.7004	499.5089	482.9177	482.9177	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000	(96)
Month fracti	1534.3204	1497.5163	1369.1801	1156.6240	895.9360	594.9704	377.7272	398.2852	636.6824	958.7991	1265.7162	1527.2739	1527.2739	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating	760.6055	604.1841	514.3640	307.4305	150.5448	0.0000	0.0000	0.0000	0.0000	310.3214	551.6692	777.0010	777.0010	(98)
Space heating per m2												3976.1205	3976.1205	(98)
										(98) / (4) =		43.4359	43.4359	(99)

8c. Space cooling requirement

Not applicable

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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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4393.5034 (211)
Space heating requirement	760.6055	604.1841	514.3640	307.4305	150.5448	0.0000	0.0000	0.0000	0.0000	310.3214	551.6692	777.0010	(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)	840.4480	667.6068	568.3580	339.7022	166.3478	0.0000	0.0000	0.0000	0.0000	342.8966	609.5793	858.5647	(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	172.4473	151.2172	156.9739	138.1616	133.5408	116.6679	109.5302	123.6685	124.5477	143.4022	154.8346	167.4401	(64)
Efficiency of water heater (217)m	89.8910	89.8408	89.7309	89.4830	88.9670	87.3000	87.3000	87.3000	87.3000	89.4636	89.7788	89.9157	(217)
Fuel for water heating, kWh/month	191.8404	168.3169	174.9385	154.3998	150.1014	133.6402	125.4642	141.6592	142.6664	160.2912	172.4623	186.2190	(219)
Water heating fuel used													1901.9994 (219)
Annual totals kWh/year													
Space heating fuel - main system													4393.5034 (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)													395.7751 (232)
Total delivered energy for all uses													6766.2779 (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	4393.5034	0.2160	948.9967	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1901.9994	0.2160	410.8319	(264)
Space and water heating			1359.8286	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	395.7751	0.5190	205.4073	(268)
Total CO2, kg/year			1604.1609	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.5200	(273)

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

DER			17.5200	ZC1
Total Floor Area		TFA	91.5400	
Assumed number of occupants		N	2.6462	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.6581	ZC2
CO2 emissions from cooking, equation (L16)			1.9938	ZC3
Total CO2 emissions			35.1719	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			35.1719	ZC8

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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	45.7700 (1b)	2.3100 (2b)	105.7287 (1b) - (3b)
First floor	45.7700 (1c)	2.5600 (2c)	117.1712 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 222.8999 (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) =	0.1346 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3846 (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) =		0.3269 (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	0.4168	0.4086	0.4005	0.3596	0.3514	0.3106	0.3106	0.3024	0.3269	0.3514	0.3678	0.3841 (22b)
	0.5869	0.5835	0.5802	0.5647	0.5617	0.5482	0.5482	0.5457	0.5534	0.5617	0.5676	0.5738 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			14.9400	1.3258	19.8068		(27)					
150mm TE Platinum GF			45.7700	0.1300	5.9501		(28a)					
50mm Alreflex Plat	135.2400	16.9100	118.3300	0.1800	21.2994		(29a)					
400mm mineral	45.7700		45.7700	0.1300	5.9501		(30)					
Total net area of external elements Aum(A, m ²)			226.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.9764		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6166 (36)					
Total fabric heat loss							(33) + (36) = 65.5930 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.1677	Feb 42.9196	Mar 42.6764	Apr 41.5342	May 41.3204	Jun 40.3256	Jul 40.3256	Aug 40.1414	Sep 40.7088	Oct 41.3204	Nov 41.7528	Dec 42.2048 (38)
Heat transfer coeff	108.7607	108.5126	108.2694	107.1272	106.9135	105.9186	105.9186	105.7344	106.3018	106.9135	107.3458	107.7978 (39)
Average = Sum(39)m / 12 =												107.1262 (39)
HLP	Jan 1.1881	Feb 1.1854	Mar 1.1828	Apr 1.1703	May 1.1679	Jun 1.1571	Jul 1.1571	Aug 1.1551	Sep 1.1613	Oct 1.1679	Nov 1.1727	Dec 1.1776 (40)
HLP (average)												1.1703 (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												2.6462 (42)
Average daily hot water use (litres/day)												97.0477 (43)
Daily hot water use	106.7524	102.8705	98.9886	95.1067	91.2248	87.3429	87.3429	91.2248	95.1067	98.9886	102.8705	106.7524 (44)
Energy content (annual)	158.3108	138.4596	142.8779	124.5644	119.5225	103.1389	95.5733	109.6718	110.9816	129.3384	141.1829	153.3155 (45)
Distribution loss (46)m = 0.15 x (45)m	23.7466	20.7689	21.4317	18.6847	17.9284	15.4708	14.3360	16.4508	16.6472	19.4008	21.1774	22.9973 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Built)

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
	50.9589	46.0274	50.4435	46.9019	46.4872	43.0732	44.5090	46.4872	46.9019	50.4435	49.3151	50.9589	50.9589	50.9589	(61)	
Total heat required for water heating calculated for each month																
Solar input	209.2697	184.4870	193.3214	171.4664	166.0097	146.2121	140.0823	156.1590	157.8836	179.7819	190.4980	204.2744	204.2744	204.2744	(62)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
														Solar input (sum of months) = Sum(63)m =		0.0000 (63)
Output from w/h																
	209.2697	184.4870	193.3214	171.4664	166.0097	146.2121	140.0823	156.1590	157.8836	179.7819	190.4980	204.2744	204.2744	204.2744	(64)	
														Total per year (kWh/year) = Sum(64)m =		2099.4455 (64)
Heat gains from water heating, kWh/month																
	65.3781	57.5447	60.1178	53.1432	51.3630	45.0620	42.9054	48.0877	48.6269	55.6159	59.2721	63.7171	63.7171	63.7171	(65)	

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

Metabolic gains (Table 5), Watts															
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5															
	22.4104	19.9047	16.1876	12.2551	9.1608	7.7339	8.3568	10.8625	14.5796	18.5122	21.6064	23.0333	23.0333	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
	241.8826	244.3925	238.0675	224.6021	207.6045	191.6292	180.9567	178.4467	184.7718	198.2372	215.2347	231.2101	231.2101	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5															
	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	(69)	
Pumps, fans															
	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)															
	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	(71)	
Water heating gains (Table b)															
	87.8737	85.6320	80.8035	73.8099	69.0363	62.5861	57.6685	64.6340	67.5373	74.7525	82.3224	85.6413	85.6413	(72)	
Total internal gains															
	417.8600	415.6225	400.7518	376.3604	351.4950	327.6425	312.6753	319.6364	332.5820	357.1951	384.8568	405.5779	405.5779	(73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	4.4700	19.6403	0.6300	0.7000	0.7700	26.8304 (76)						
Southeast	4.2500	36.7938	0.6300	0.7000	0.7700	47.7899 (77)						
West	2.7800	19.6403	0.6300	0.7000	0.7700	16.6864 (80)						
Northwest	3.4400	11.2829	0.6300	0.7000	0.7700	11.8619 (81)						
Solar gains	103.1685	190.6771	295.0760	413.9126	501.1894	512.3531	487.9371	421.7142	336.6603	220.4875	126.4269	86.3713 (83)
Total gains	521.0285	606.2996	695.8279	790.2730	852.6844	839.9956	800.6124	741.3506	669.2423	577.6827	511.2837	491.9492 (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)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	58.4489	58.5825	58.7141	59.3402	59.4588	60.0173	60.0173	60.1218	59.8009	59.4588	59.2193	58.9710	21.0000 (85)
alpha	4.8966	4.9055	4.9143	4.9560	4.9639	5.0012	5.0012	5.0081	4.9867	4.9639	4.9480	4.9314	
util living area	0.9984	0.9964	0.9897	0.9645	0.8893	0.7334	0.5652	0.6264	0.8687	0.9810	0.9967	0.9988	(86)
MIT	19.6794	19.8349	20.1012	20.4542	20.7587	20.9366	20.9861	20.9774	20.8443	20.4425	19.9961	19.6529	(87)
Th 2	19.9295	19.9317	19.9338	19.9439	19.9457	19.9545	19.9545	19.9561	19.9511	19.9457	19.9419	19.9380	(88)
util rest of house	0.9979	0.9951	0.9859	0.9506	0.8459	0.6412	0.4395	0.4987	0.8011	0.9711	0.9953	0.9984	(89)
MIT 2	18.1687	18.3971	18.7859	19.2973	19.7056	19.9117	19.9494	19.9467	19.8223	19.2894	18.6405	18.1358	(90)
Living area fraction									FLA = Living area / (4) =				0.1792 (91)
MIT	18.4393	18.6547	19.0216	19.5045	19.8943	20.0953	20.1351	20.1313	20.0054	19.4960	18.8834	18.4076	(92)
Temperature adjustment													0.0000
adjusted MIT	18.4393	18.6547	19.0216	19.5045	19.8943	20.0953	20.1351	20.1313	20.0054	19.4960	18.8834	18.4076	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9967	0.9928	0.9813	0.9431	0.8434	0.6547	0.4621	0.5214	0.8052	0.9652	0.9932	0.9975	(94)
Useful gains	519.3054	601.9425	682.8021	745.2793	719.1408	549.9632	369.9300	386.5115	538.8919	557.5652	507.8223	490.7134	(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	1537.0036	1492.5610	1355.7044	1136.0349	876.0791	582.0540	374.4328	394.5311	627.7559	951.1018	1264.8995	1531.5463	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	757.7627	598.4956	500.6393	281.3440	116.7621	0.0000	0.0000	0.0000	0.0000	292.7912	545.0956	774.3797	(98)
Space heating												3867.2703	(98)
Space heating per m2												(98) / (4) =	47.2468 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4140.5463 (211)
Space heating requirement	757.7627	598.4956	500.6393	281.3440	116.7621	0.0000	0.0000	0.0000	0.0000	292.7912	545.0956	774.3797	(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)	811.3091	640.7876	536.0164	301.2249	125.0129	0.0000	0.0000	0.0000	0.0000	313.4809	583.6141	829.1004	(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	209.2697	184.4870	193.3214	171.4664	166.0097	146.2121	140.0823	156.1590	157.8836	179.7819	190.4980	204.2744	(64)
Efficiency of water heater (217)m	88.0046	87.7980	87.3397	86.2901	84.1837	80.3000	80.3000	80.3000	80.3000	86.2719	87.5483	88.0874	(216)
Fuel for water heating, kWh/month	237.7940	210.1266	221.3443	198.7092	197.1993	182.0823	174.4487	194.4694	196.6171	208.3899	217.5919	231.8998	(219)
Water heating fuel used													2470.6727 (219)
Annual totals kWh/year													
Space heating fuel - main system													4140.5463 (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)													395.7751 (232)
Total delivered energy for all uses													7081.9941 (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	4140.5463	0.2160	894.3580	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2470.6727	0.2160	533.6653	(264)
Space and water heating			1428.0233	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	395.7751	0.5190	205.4073	(268)
Total CO2, kg/m2/year			1672.3556	(272)
Emissions per m2 for space and water heating			15.6000	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2439	(272b)
Emissions per m2 for pumps and fans			0.4252	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6000 * 1.00) + 2.2439 + 0.4252, rounded to 2 d.p.			18.2700	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.7700 (1b)	x 2.3100 (2b)	= 105.7287 (1b) - (3b)
First floor	45.7700 (1c)	x 2.5600 (2c)	= 117.1712 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 222.8999 (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) = 0.1346 (8)							
Pressure test					Yes							
Measured/design AP50					4.1200							
Infiltration rate					0.3406 (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) = 0.2895 (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	0.3691	0.3619	0.3546	0.3185	0.3112	0.2750	0.2750	0.2678	0.2895	0.3112	0.3257	0.3402 (22b)
	0.5681	0.5655	0.5629	0.5507	0.5484	0.5378	0.5378	0.5359	0.5419	0.5484	0.5530	0.5579 (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)			14.9400	1.3347	19.9407		(27)					
Opening Type 11			1.9700	1.0000	1.9700		(26)					
150mm TE Platinum GF			45.7700	0.1500	6.8655		(28a)					
50mm Alreflex Plat	135.2400	16.9100	118.3300	0.2700	31.9491		(29a)					
400mm mineral	45.7700		45.7700	0.1100	5.0347		(30)					
Total net area of external elements Aum(A, m ²)			226.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 65.7600		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.2000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4596 (36)					
Total fabric heat loss							(33) + (36) = 74.2197 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.7894	Feb 41.5948	Mar 41.4041	Apr 40.5082	May 40.3406	Jun 39.5604	Jul 39.5604	Aug 39.4159	Sep 39.8609	Oct 40.3406	Nov 40.6797	Dec 41.0342 (38)
Heat transfer coeff	116.0090	115.8144	115.6237	114.7279	114.5603	113.7800	113.7800	113.6355	114.0806	114.5603	114.8993	115.2539 (39)
Average = Sum(39)m / 12 =												114.7271 (39)
HLP	Jan 1.2673	Feb 1.2652	Mar 1.2631	Apr 1.2533	May 1.2515	Jun 1.2430	Jul 1.2430	Aug 1.2414	Sep 1.2462	Oct 1.2515	Nov 1.2552	Dec 1.2591 (40)
HLP (average)												1.2533 (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												2.6462 (42)
Average daily hot water use (litres/day)												97.0477 (43)
Daily hot water use	106.7524	102.8705	98.9886	95.1067	91.2248	87.3429	87.3429	91.2248	95.1067	98.9886	102.8705	106.7524 (44)
Energy content (annual)	158.3108	138.4596	142.8779	124.5644	119.5225	103.1389	95.5733	109.6718	110.9816	129.3384	141.1829	153.3155 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1526.9378 (45)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											663.2691 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	49.2756	64.8355	51.7062	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											165.8173 (107)
Space cooling per m2											1.8114 (108)
Energy for space heating											48.2498 (99)
Energy for space cooling											1.8114 (108)
Total											50.0612 (109)
Dwelling Fabric Energy Efficiency (DFEE)											50.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.7700 (1b)	x 2.3100 (2b)	= 105.7287 (1b) - (3b)
First floor	45.7700 (1c)	x 2.5600 (2c)	= 117.1712 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 222.8999 (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) = 0.1346 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3846 (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) = 0.3269 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate												
Effective ac	0.4168	0.4086	0.4005	0.3596	0.3514	0.3106	0.3106	0.3024	0.3269	0.3514	0.3678	0.3841 (22b)
	0.5869	0.5835	0.5802	0.5647	0.5617	0.5482	0.5482	0.5457	0.5534	0.5617	0.5676	0.5738 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			1.9700	1.0000	1.9700		(26)					
TER Opening Type (Uw = 1.40)			14.9400	1.3258	19.8068		(27)					
150mm TE Platinum GF			45.7700	0.1300	5.9501		(28a)					
50mm Alreflex Plat	135.2400	16.9100	118.3300	0.1800	21.2994		(29a)					
400mm mineral	45.7700		45.7700	0.1300	5.9501		(30)					
Total net area of external elements Aum(A, m ²)			226.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.9764		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6166 (36)					
Total fabric heat loss							(33) + (36) = 65.5930 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.1677	Feb 42.9196	Mar 42.6764	Apr 41.5342	May 41.3204	Jun 40.3256	Jul 40.3256	Aug 40.1414	Sep 40.7088	Oct 41.3204	Nov 41.7528	Dec 42.2048 (38)
Heat transfer coeff	108.7607	108.5126	108.2694	107.1272	106.9135	105.9186	105.9186	105.7344	106.3018	106.9135	107.3458	107.7978 (39)
Average = Sum(39)m / 12 =												107.1262 (39)
HLP	Jan 1.1881	Feb 1.1854	Mar 1.1828	Apr 1.1703	May 1.1679	Jun 1.1571	Jul 1.1571	Aug 1.1551	Sep 1.1613	Oct 1.1679	Nov 1.1727	Dec 1.1776 (40)
HLP (average)												1.1703 (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												2.6462 (42)
Average daily hot water use (litres/day)												97.0477 (43)
Daily hot water use	106.7524	102.8705	98.9886	95.1067	91.2248	87.3429	87.3429	91.2248	95.1067	98.9886	102.8705	106.7524 (44)
Energy conte	158.3108	138.4596	142.8779	124.5644	119.5225	103.1389	95.5733	109.6718	110.9816	129.3384	141.1829	153.3155 (45)
Energy content (annual)												Total = Sum(45)m = 1526.9378 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	33.6410	29.4227	30.3616	26.4699	25.3985	21.9170	20.3093	23.3053	23.5836	27.4844	30.0014	32.5796 (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	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109	132.3109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4104	19.9047	16.1876	12.2551	9.1608	7.7339	8.3568	10.8625	14.5796	18.5122	21.6064	23.0333 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.8826	244.3925	238.0675	224.6021	207.6045	191.6292	180.9567	178.4467	184.7718	198.2372	215.2347	231.2101 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311	36.2311 (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)	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487	-105.8487 (71)
Water heating gains (Table 5)	45.2165	43.7837	40.8085	36.7638	34.1378	30.4403	27.2975	31.3243	32.7550	36.9414	41.6686	43.7897 (72)
Total internal gains	372.2027	370.7743	357.7569	336.3143	313.5964	292.4967	279.3043	283.3267	294.7997	316.3840	341.2030	360.7263 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	4.4700	19.6403	0.6300	0.7000	0.7700	26.8304 (76)
Southeast	4.2500	36.7938	0.6300	0.7000	0.7700	47.7899 (77)
West	2.7800	19.6403	0.6300	0.7000	0.7700	16.6864 (80)
Northwest	3.4400	11.2829	0.6300	0.7000	0.7700	11.8619 (81)

Solar gains	103.1685	190.6771	295.0760	413.9126	501.1894	512.3531	487.9371	421.7142	336.6603	220.4875	126.4269	86.3713 (83)
Total gains	475.3712	561.4514	652.8329	750.2268	814.7858	804.8498	767.2414	705.0409	631.4600	536.8715	467.6299	447.0976 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.4489	58.5825	58.7141	59.3402	59.4588	60.0173	60.0173	60.1218	59.8009	59.4588	59.2193	58.9710	
alpha	4.8966	4.9055	4.9143	4.9560	4.9639	5.0012	5.0012	5.0081	4.9867	4.9639	4.9480	4.9314	
util living area	0.9990	0.9974	0.9921	0.9709	0.9033	0.7547	0.5867	0.6525	0.8887	0.9859	0.9978	0.9992 (86)	
MIT	19.6332	19.7899	20.0595	20.4195	20.7359	20.9278	20.9837	20.9730	20.8236	20.4042	19.9522	19.6073 (87)	
Th 2	19.9295	19.9317	19.9338	19.9439	19.9457	19.9545	19.9545	19.9561	19.9511	19.9457	19.9419	19.9380 (88)	
util rest of house	0.9986	0.9965	0.9892	0.9590	0.8633	0.6635	0.4577	0.5224	0.8266	0.9783	0.9969	0.9990 (89)	
MIT 2	18.6812	18.8393	19.1090	19.4699	19.7636	19.9205	19.9503	19.9482	19.8487	19.4610	19.0097	18.6621 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	18.8518	19.0096	19.2793	19.6401	19.9378	20.1010	20.1354	20.1318	20.0234	19.6300	19.1786	18.8314 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.8518	19.0096	19.2793	19.6401	19.9378	20.1010	20.1354	20.1318	20.0234	19.6300	19.1786	18.8314 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9954	0.9867	0.9547	0.8630	0.6775	0.4811	0.5458	0.8318	0.9751	0.9959	0.9986 (94)	
Useful gains	474.4497	558.8522	644.1309	716.2080	703.1391	545.3127	369.0905	384.7869	525.2330	523.5233	465.7015	446.4579 (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	1582.6609	1531.0683	1383.6079	1150.5532	880.7266	582.6573	374.4681	394.5813	629.6645	965.4300	1296.5847	1577.2335 (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	824.5091	653.3292	550.1709	312.7286	132.1251	0.0000	0.0000	0.0000	0.0000	328.7786	598.2359	841.2970 (98)	
Space heating													4241.1744 (98)
Space heating per m ²													(98) / (4) = 46.3314 (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	995.6349	783.7977	803.5812	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8514	0.9154	0.8860	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	847.6829	717.5219	711.9835	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1041.0911	995.0381	924.1794	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	139.2539	206.4720	157.8738	0.0000	0.0000	0.0000	0.0000 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling											503.5997 (104)
Cooled fraction										FC - cooled area / (4) -	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	34.8135	51.6180	39.4684	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											125.8999 (107)
Space cooling per m2											1.3754 (108)
Energy for space heating											46.3314 (99)
Energy for space cooling											1.3754 (108)
Total											47.7067 (109)
Target Fabric Energy Efficiency (TFEE)											54.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Moresby Detached BeamBlock			Issued on Date	15/10/2021
Assessment Reference	1	Prop Type Ref			
Property	Plot 181, Chipping Lane , Longridge , PR3				
SAP Rating	83 B	DER	18.46	TER	19.01
Environmental	86 B	% DER<TER	2.88		
CO₂ Emissions (t/year)	1.35	DFEE	51.82	TFEE	56.00
General Requirements Compliance	Pass	% DFEE<TFEE	7.47		
Assessor Details	Mr. William Vincent, William Vincent, Tel: 01582544250, William.Vincent@ee-ltd.co.uk			Assessor ID	T759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Detached House, total floor area 81 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.01 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.46 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.41 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

Hot water storage: No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock

Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

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

Based on:

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

10 Key features

Roof U-value	0.11 W/m ² K
Door U-value	1.00 W/m ² K
Thermal bridging y-value	0.036 W/m ² K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				4 * 10 =	40.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.2023 (8)							
Pressure test				Yes								
Measured/design AP50					5.0100							
Infiltration rate					0.4528 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3849 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4907	0.4811	0.4715	0.4233	0.4137	0.3656	0.3656	0.3560	0.3849	0.4137	0.4330	0.4522 (22b)
Effective ac	0.6204	0.6157	0.6111	0.5896	0.5856	0.5668	0.5668	0.5634	0.5741	0.5856	0.5937	0.6022 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Opening Type 1			1.9700	1.0000	1.9700		(26)					
Opening Type 2 (Uw = 1.41)			15.0600	1.3347	20.1009		(27)					
150mm B&B			40.4400	0.1500	6.0660		(28a)					
50mm A. Platinium	128.2300	17.0300	111.2000	0.2700	30.0240		(29a)					
400mm Mineral wool	40.4400		40.4400	0.1100	4.4484		(30)					
Total net area of external elements Aum(A, m ²)			209.1100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		62.6093 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.1830 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5069 (36)					
Total fabric heat loss						(33) + (36) =	70.1162 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 40.4854	Feb 40.1804	Mar 39.8813	Apr 38.4768	May 38.2140	Jun 36.9907	Jul 36.9907	Aug 36.7641	Sep 37.4619	Oct 38.2140	Nov 38.7456	Dec 39.3014 (38)
Heat transfer coeff	110.6017	110.2966	109.9976	108.5930	108.3302	107.1069	107.1069	106.9804	107.5781	108.3302	108.8618	109.4176 (39)
Average = Sum(39)m / 12 =												108.5918 (39)
HLP	Jan 1.3675	Feb 1.3637	Mar 1.3600	Apr 1.3426	May 1.3394	Jun 1.3243	Jul 1.3243	Aug 1.3215	Sep 1.3301	Oct 1.3394	Nov 1.3460	Dec 1.3528 (40)
HLP (average)												1.3426 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4793 (42)
Average daily hot water use (litres/day)												93.0845 (43)
Daily hot water use	102.3929	98.6695	94.9462	91.2228	87.4994	83.7760	83.7760	87.4994	91.2228	94.9462	98.6695	102.3929 (44)
Energy content (annual)	151.8457	132.8053	137.0431	119.4775	114.6415	98.9269	91.6703	105.1930	106.4494	124.0565	135.4174	147.0545 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7769	19.9208	20.5565	17.9216	17.1962	14.8390	13.7505	15.7790	15.9674	18.6085	20.3126	22.0582 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	123.9673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.0440	17.8029	14.4783	10.9610	8.1935	6.9173	7.4744	9.7155	13.0401	16.5574	19.3249	20.6011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.2699	223.5660	217.7799	205.4621	189.9130	175.2990	165.5360	163.2399	169.0260	181.3438	196.8929	211.5069	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	35.3967	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	-99.1738	(71)
Water heating gains (Table b)	72.6061	70.4504	65.9732	59.8887	55.9377	50.3766	45.6527	51.7084	53.8623	60.1594	67.2703	70.4610	(72)
Total internal gains	377.1102	375.0095	361.4216	339.5020	317.2343	295.7831	281.8533	287.8540	299.1186	321.2508	346.6784	365.7592	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	(83)				
Northeast	0.6600	11.2829	0.7100	0.7100	0.7000	0.7700	2.5648	(75)					
Southeast	3.7100	36.7938	0.7100	0.7100	0.7000	0.7700	47.0152	(77)					
Southwest	5.3400	36.7938	0.7100	0.7100	0.7000	0.7700	67.6715	(79)					
Northwest	5.3500	11.2829	0.7100	0.7100	0.7000	0.7700	20.7905	(81)					
Solar gains	138.0421	242.8945	352.9447	471.8541	560.0411	569.8581	543.6332	475.7218	393.7898	274.0060	166.7554	117.2211	(83)
Total gains	515.1523	617.9040	714.3663	811.3561	877.2754	865.6411	825.4865	763.5757	692.9084	595.2568	513.4338	482.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	38.8353	38.9427	39.0485	39.5536	39.6495	40.1024	40.1024	40.1874	39.9268	39.6495	39.4559	39.2555
alpha	3.5890	3.5962	3.6032	3.6369	3.6433	3.6735	3.6735	3.6792	3.6618	3.6433	3.6304	3.6170	
util living area	0.9926	0.9852	0.9687	0.9258	0.8353	0.6865	0.5372	0.5919	0.8117	0.9513	0.9869	0.9941	(86)
MIT	19.1830	19.4113	19.7697	20.2303	20.6241	20.8748	20.9618	20.9454	20.7533	20.2332	19.6246	19.1468	(87)
Th 2	19.7884	19.7913	19.7941	19.8076	19.8101	19.8219	19.8219	19.8241	19.8173	19.8101	19.8050	19.7997	(88)
util rest of house	0.9906	0.9812	0.9598	0.9038	0.7852	0.5933	0.4080	0.4621	0.7364	0.9324	0.9826	0.9925	(89)
MIT 2	17.3921	17.7253	18.2443	18.9039	19.4298	19.7299	19.8052	19.7976	19.6069	18.9228	18.0465	17.3464	(90)
Living area fraction	17.7417	18.0544	18.5421	19.1628	19.6630	19.9535	20.0310	20.0217	19.8307	19.1786	18.3546	17.6979	(92)
Temperature adjustment	17.5917	17.9044	18.3921	19.0128	19.5130	19.8035	19.8910	19.8717	19.6807	19.0286	18.2046	17.5479	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	0.9848	0.9719	0.9453	0.8848	0.7704	0.5917	0.4149	0.4678	0.7260	0.9151	0.9738	0.9877	(94)
Ext temp.	507.3244	600.5218	675.2901	717.9236	675.8142	512.1776	342.4922	357.1729	503.0463	544.7298	499.9888	477.0381	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1470.0884	1434.3424	1308.0993	1098.1824	846.3838	557.3255	351.4171	371.0545	600.3624	913.0707	1208.8629	1460.4936	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	716.2964	560.3274	470.8101	273.7863	126.9038	0.0000	0.0000	0.0000	0.0000	274.0457	510.3893	731.6909	(98)
(98) / (4) =												3664.2498	(98)
												45.3048	(99)

8c. Space cooling requirement

Not applicable