

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025I_124_As_Built				Issued on Date	04/02/2022
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	83 B	DER	18.76	TER	19.60	
Environmental	88 B	% DER<TER	4.28			
CO ₂ Emissions (t/year)	0.87	DFEE	44.69	TFEE	48.07	
General Requirements Compliance	Pass	% DFEE<TFEE	7.03			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Top-floor flat, total floor area 57 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) 19.60 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.76 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.29 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.71 (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: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing East: 6.42 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.7 m³/m²h

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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	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (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					0 * 10 = 0.0000 (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) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.7100
Infiltration rate					0.1855 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1438 (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	0.1833	0.1797	0.1761	0.1581	0.1545	0.1366	0.1366	0.1330	0.1438	0.1545	0.1617	0.1689 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Flat Roof	56.6900		56.6900	0.1500	8.5035		(30)
Total net area of external elements Aum(A, m ²)			105.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.7323	(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1809 (36)
Total fabric heat loss							(33) + (36) = 37.9132 (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	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492 (38)
Average = Sum(39)m / 12 =	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648 (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												
Average daily hot water use (litres/day)												1.8867 (42)
												79.0086 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy content (annual)	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1243.1123 (45)
	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (46)

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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	(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	(57)
Combi loss	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169 (61)
Total heat required for water heating calculated for each month												
	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343 (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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343 (64)
								Total per year (kWh/year) = Sum(64)m =				1407.4652 (64)
Heat gains from water heating, kWh/month	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060 (65)

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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													2384.5569 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.9757	334.2802	279.0209	157.2091	63.5797	0.0000	0.0000	0.0000	0.0000	163.3304	305.8766	434.7515	(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)	464.0616	369.3704	308.3104	173.7117	70.2538	0.0000	0.0000	0.0000	0.0000	180.4756	337.9852	480.3884	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Efficiency of water heater (217)m	89.6655	89.6041	89.4562	89.1205	88.4373	87.3000	87.3000	87.3000	87.3000	89.1214	89.5293	87.3000	(216)
Fuel for water heating, kWh/month	159.3807	139.9207	145.6596	128.9398	125.7793	111.5964	105.0374	118.2152	118.9384	133.8145	143.5104	154.7692	(219)
Water heating fuel used													1585.5614 (219)
Annual totals kWh/year													
Space heating fuel - main system													2384.5569 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													30.5419 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													105.5419 (231)
Electricity for lighting (calculated in Appendix L)													291.2184 (232)
Total delivered energy for all uses													4366.8786 (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	2384.5569	0.2160	515.0643	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1585.5614	0.2160	342.4813	(264)
Space and water heating			857.5456	(265)
Pumps and fans	105.5419	0.5190	54.7762	(267)
Energy for lighting	291.2184	0.5190	151.1423	(268)
Total CO2, kg/year			1063.4641	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.7600	(273)

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

DER			18.7600	ZC1
Total Floor Area		TFA	56.6900	
Assumed number of occupants		N	1.8867	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.1982	ZC2
CO2 emissions from cooking, equation (L16)			2.8979	ZC3
Total CO2 emissions			38.8560	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			38.8560	ZC8

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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	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1470 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3970 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3077 (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												
	0.3923	0.3846	0.3769	0.3384	0.3307	0.2923	0.2923	0.2846	0.3077	0.3307	0.3461	0.3615 (22b)
Effective ac	0.5769	0.5740	0.5710	0.5573	0.5547	0.5427	0.5427	0.5405	0.5473	0.5547	0.5599	0.5653 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114		(27)
WT-E-01	22.5600	6.4200	16.1400	0.1800	2.9052		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.1800	4.3272		(29a)
Flat Roof	56.6900		56.6900	0.1300	7.3697		(30)
Total net area of external elements Aum, m ²			105.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.2335	(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)							8.3035 (36)
Total fabric heat loss						(33) + (36) =	33.5370 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.9039	25.7697	25.6382	25.0206	24.9051	24.3672	24.3672	24.2675	24.5744	24.9051	25.1388	25.3832 (38)
Heat transfer coeff	59.4408	59.3067	59.1752	58.5576	58.4420	57.9041	57.9041	57.8045	58.1113	58.4420	58.6758	58.9202 (39)
Average = Sum(39)m / 12 =												58.5570 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0485	1.0462	1.0438	1.0329	1.0309	1.0214	1.0214	1.0197	1.0251	1.0309	1.0350	1.0393 (40)
HLP (average)												1.0329 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)										Total = Sum(45)m =		1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	44.2881	38.5475	41.0671	38.1839	37.8462	35.0668	36.2357	37.8462	38.1839	41.0671	41.3009	44.2881 (61)
Total heat required for water heating calculated for each month	173.1722	151.2704	157.3871	139.5944	135.1520	119.0343	114.0440	127.1323	128.5363	146.3642	156.2409	169.1055 (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	173.1722	151.2704	157.3871	139.5944	135.1520	119.0343	114.0440	127.1323	128.5363	146.3642	156.2409	169.1055 (64)
Heat gains from water heating, kWh/month	53.9260	47.1172	48.9432	43.2650	41.8157	36.6859	34.9302	39.1492	39.5882	45.2781	48.5428	52.5738 (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	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4900	14.6463	11.9111	9.0175	6.7407	5.6908	6.1491	7.9928	10.7279	13.6216	15.8984	16.9483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.5289	166.2362	161.9339	152.7747	141.2129	130.3465	123.0870	121.3797	125.6821	134.8412	146.4030	157.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	72.4812	70.1150	65.7838	60.0902	56.2039	50.9527	46.9492	52.6199	54.9836	60.8576	67.4205	70.6637	(72)
Total internal gains	307.8002	305.2975	293.9290	276.1826	258.4577	241.2901	230.4854	236.2926	245.6937	263.6206	284.0221	299.1816	(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					6.4200	19.6403		0.6300	0.7000	0.7700		38.5349 (76)
Solar gains	38.5349	75.3824	124.1441	181.0568	221.8919	227.1458	216.2521	185.7574	144.3847	89.4476	48.0485	31.6892 (83)
Total gains	346.3351	380.6800	418.0731	457.2394	480.3496	468.4359	446.7375	422.0499	390.0785	353.0682	332.0705	330.8708 (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	66.2306	66.3805	66.5280	67.2296	67.3626	67.9884	67.9884	68.1055	67.7459	67.3626	67.0942	66.8159	
alpha	5.4154	5.4254	5.4352	5.4820	5.4908	5.5326	5.5326	5.5404	5.5164	5.4908	5.4729	5.4544	
util living area	0.9978	0.9959	0.9896	0.9659	0.8931	0.7334	0.5591	0.6111	0.8579	0.9781	0.9957	0.9983	(86)
MIT	19.9078	20.0278	20.2494	20.5482	20.8061	20.9542	20.9915	20.9864	20.8876	20.5556	20.1794	19.8849	(87)
Th 2	20.0431	20.0450	20.0470	20.0560	20.0577	20.0655	20.0655	20.0670	20.0625	20.0577	20.0542	20.0507	(88)
util rest of house	0.9971	0.9945	0.9859	0.9529	0.8529	0.6485	0.4462	0.4967	0.7923	0.9674	0.9939	0.9977	(89)
MIT 2	18.5834	18.7599	19.0833	19.5166	19.8624	20.0340	20.0622	20.0611	19.9696	19.5339	18.9884	18.5555	(90)
Living area fraction	19.2397	19.3882	19.6611	20.0277	20.3300	20.4899	20.5227	20.5196	20.4244	20.0401	19.5786	19.2142	(91)
MIT	19.2397	19.3882	19.6611	20.0277	20.3300	20.4899	20.5227	20.5196	20.4244	20.0401	19.5786	19.2142	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2397	19.3882	19.6611	20.0277	20.3300	20.4899	20.5227	20.5196	20.4244	20.0401	19.5786	19.2142	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9963	0.9932	0.9840	0.9524	0.8658	0.6889	0.5024	0.5537	0.8202	0.9671	0.9927	0.9971	(94)
Ext temp.	345.0428	378.1064	411.3661	435.4885	415.8809	322.7229	224.4604	233.6715	319.9593	341.4675	329.6605	329.8995	(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	888.0265	859.2464	778.8113	651.6131	504.3528	341.0505	227.1388	238.1328	367.5220	551.7011	732.1894	884.6392	(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	403.9798	323.3261	273.3793	155.6097	65.8231	0.0000	0.0000	0.0000	0.0000	156.4138	289.8208	412.7264	(98)
												2081.0790	(98)
												36.7098	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													2228.1360 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	403.9798	323.3261	273.3793	155.6097	65.8231	0.0000	0.0000	0.0000	0.0000	156.4138	289.8208	412.7264	(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)	432.5266	346.1736	292.6973	166.6057	70.4744	0.0000	0.0000	0.0000	0.0000	167.4666	310.3007	441.8912	(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	173.1722	151.2704	157.3871	139.5944	135.1520	119.0343	114.0440	127.1323	128.5363	146.3642	156.2409	169.1055	(64)
Efficiency of water heater	87.1124	86.9156	86.4282	85.3251	83.3500	80.3000	80.3000	80.3000	80.3000	85.2186	86.5854	87.2118	(217)
Fuel for water heating, kWh/month	198.7916	174.0430	182.1016	163.6030	162.1501	148.2370	142.0224	158.3217	160.0702	171.7516	180.4472	193.9020	(219)
Water heating fuel used												2035.4414	(219)
Annual totals kWh/year													
Space heating fuel - main system												2228.1360	(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)												291.2184	(232)
Total delivered energy for all uses												4629.7957	(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	2228.1360	0.2160	481.2774 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2035.4414	0.2160	439.6553 (264)
Space and water heating			920.9327 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.2184	0.5190	151.1423 (268)
Total CO2, kg/m2/year			1111.0000 (272)
Emissions per m2 for space and water heating			16.2451 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6661 (272b)
Emissions per m2 for pumps and fans			0.6866 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2451 * 1.00) + 2.6661 + 0.6866, rounded to 2 d.p.			19.6000 (273)

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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	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1470 (8)
Measured/design AP50					Yes
Infiltration rate					3.7100
Number of sides sheltered					0.3325 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2577 (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												
	0.3285	0.3221	0.3157	0.2835	0.2770	0.2448	0.2448	0.2384	0.2577	0.2770	0.2899	0.3028 (22b)
Effective ac	0.5540	0.5519	0.5498	0.5402	0.5384	0.5300	0.5300	0.5284	0.5332	0.5384	0.5420	0.5458 (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			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Flat Roof	56.6900		56.6900	0.1500	8.5035		(30)
Total net area of external elements Aum, m ²			105.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7323		(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1809 (36)
Total fabric heat loss						(33) + (36) =	37.9132 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.8725	24.7784	24.6862	24.2530	24.1719	23.7946	23.7946	23.7247	23.9399	24.1719	24.3359	24.5073 (38)
Heat transfer coeff	62.7857	62.6916	62.5994	62.1661	62.0851	61.7078	61.7078	61.6379	61.8531	62.0851	62.2491	62.4205 (39)
Average = Sum(39)m / 12 =												62.1658 (39)
HLP	1.1075	1.1059	1.1042	1.0966	1.0952	1.0885	1.0885	1.0873	1.0911	1.0952	1.0981	1.1011 (40)
HLP (average)												1.0966 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy content (annual)	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1243.1123 (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 (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 (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	27.3879	23.9536	24.7180	21.5497	20.6775	17.8431	16.5343	18.9733	19.1999	22.3756	24.4248	26.5237 (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	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4900	14.6463	11.9111	9.0175	6.7407	5.6908	6.1491	7.9928	10.7279	13.6216	15.8984	16.9483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.5289	166.2362	161.9339	152.7747	141.2129	130.3465	123.0870	121.3797	125.6821	134.8412	146.4030	157.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	36.8117	35.6453	33.2231	29.9302	27.7923	24.7821	22.2235	25.5017	26.6665	30.0748	33.9233	35.6501	(72)
Total internal gains	269.1307	267.8279	258.3682	243.0226	227.0461	212.1195	202.7597	206.1744	214.3767	229.8377	247.5248	261.1680	(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					6.4200	19.6403	0.4500	0.0000			0.7700			43.6904 (76)

Solar gains	43.6904	85.4676	140.7530	205.2798	251.5781	257.5350	245.1838	210.6093	163.7015	101.4145	54.4767	35.9288	(83)	
Total gains	312.8211	353.2955	399.1212	448.3024	478.6242	469.6545	447.9435	416.7837	378.0782	331.2522	302.0015	297.0968	(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	62.7023	62.7964	62.8889	63.3272	63.4098	63.7976	63.7976	63.8699	63.6477	63.4098	63.2428	63.0691	
alpha	5.1802	5.1864	5.1926	5.2218	5.2273	5.2532	5.2532	5.2580	5.2432	5.2273	5.2162	5.2046	
util living area	0.9987	0.9972	0.9921	0.9718	0.9069	0.7595	0.5881	0.6488	0.8861	0.9849	0.9973	0.9990	(86)
MIT	19.7710	19.9027	20.1451	20.4704	20.7602	20.9360	20.9865	20.9780	20.8463	20.4655	20.0566	19.7432	(87)
Th 2	19.9947	19.9960	19.9974	20.0036	20.0048	20.0102	20.0102	20.0112	20.0081	20.0048	20.0024	19.9999	(88)
util rest of house	0.9982	0.9962	0.9892	0.9605	0.8689	0.6720	0.4650	0.5247	0.8252	0.9770	0.9962	0.9986	(89)
MIT 2	18.8708	19.0033	19.2454	19.5692	19.8379	19.9797	20.0067	20.0047	19.9186	19.5692	19.1623	18.8473	(90)
Living area fraction	19.3169	19.4489	19.6912	20.0158	20.2949	20.4535	20.4922	20.4870	20.3783	20.0133	19.6054	19.2912	(91)
MIT	19.3169	19.4489	19.6912	20.0158	20.2949	20.4535	20.4922	20.4870	20.3783	20.0133	19.6054	19.2912	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3169	19.4489	19.6912	20.0158	20.2949	20.4535	20.4922	20.4870	20.3783	20.0133	19.6054	19.2912	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	312.1314	351.7095	394.3394	430.6683	421.8455	335.1648	235.8739	244.5363	321.6863	323.6527	300.6742	296.5952	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.8445	912.0968	825.7612	691.0238	533.6152	361.2081	240.1772	251.9113	388.3321	584.4272	778.4515	942.0030	(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	469.2506	376.5803	320.9778	187.4559	83.1567	0.0000	0.0000	0.0000	0.0000	194.0162	343.9997	480.1833	(98)
Space heating												2455.6205	(98)
Space heating per m ²												43.3166	(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	580.0530	456.6375	468.4480	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8670	0.9279	0.9043	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	502.9047	423.7311	423.6034	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	620.5112	593.8269	558.7545	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	84.6766	126.5513	100.5524	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												311.7803	(104)
Cooled fraction												1.0000	(105)

$$fC = \text{cooled area} / (4) =$$

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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	21.1692	31.6378	25.1381	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											77.9451 (107)
Space cooling per m2											1.3749 (108)
Energy for space heating											43.3166 (99)
Energy for space cooling											1.3749 (108)
Total											44.6916 (109)
Dwelling Fabric Energy Efficiency (DFEE)											44.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1470 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3970 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3077 (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												
Effective ac	0.3923	0.3846	0.3769	0.3384	0.3307	0.2923	0.2923	0.2846	0.3077	0.3307	0.3461	0.3615 (22b)
Effective ac	0.5769	0.5740	0.5710	0.5573	0.5547	0.5427	0.5427	0.5405	0.5473	0.5547	0.5599	0.5653 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114		(27)
WT-E-01	22.5600	6.4200	16.1400	0.1800	2.9052		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.1800	4.3272		(29a)
Flat Roof	56.6900		56.6900	0.1300	7.3697		(30)
Total net area of external elements Aum, m ²			105.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.2335	(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)							8.3035 (36)
Total fabric heat loss						(33) + (36) =	33.5370 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.9039	25.7697	25.6382	25.0206	24.9051	24.3672	24.3672	24.2675	24.5744	24.9051	25.1388	25.3832 (38)
Heat transfer coeff	59.4408	59.3067	59.1752	58.5576	58.4420	57.9041	57.9041	57.8045	58.1113	58.4420	58.6758	58.9202 (39)
Average = Sum(39)m / 12 =												58.5570 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0485	1.0462	1.0438	1.0329	1.0309	1.0214	1.0214	1.0197	1.0251	1.0309	1.0350	1.0393 (40)
HLP (average)												1.0329 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)										Total = Sum(45)m =		1243.1123 (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 (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	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	27.3879	23.9536	24.7180	21.5497	20.6775	17.8431	16.5343	18.9733	19.1999	22.3756	24.4248	26.5237 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4900	14.6463	11.9111	9.0175	6.7407	5.6908	6.1491	7.9928	10.7279	13.6216	15.8984	16.9483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.5289	166.2362	161.9339	152.7747	141.2129	130.3465	123.0870	121.3797	125.6821	134.8412	146.4030	157.2694 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334 (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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671 (71)
Water heating gains (Table 5)	36.8117	35.6453	33.2231	29.9302	27.7923	24.7821	22.2235	25.5017	26.6665	30.0748	33.9233	35.6501 (72)
Total internal gains	269.1307	267.8279	258.3682	243.0226	227.0461	212.1195	202.7597	206.1744	214.3767	229.8377	247.5248	261.1680 (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					6.4200	19.6403		0.6300	0.7000	0.7700		38.5349 (76)
Solar gains	38.5349	75.3824	124.1441	181.0568	221.8919	227.1458	216.2521	185.7574	144.3847	89.4476	48.0485	31.6892 (83)
Total gains	307.6656	343.2103	382.5124	424.0793	448.9380	439.2653	419.0118	391.9318	358.7614	319.2853	295.5733	292.8572 (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	66.2306	66.3805	66.5280	67.2296	67.3626	67.9884	67.9884	68.1055	67.7459	67.3626	67.0942	66.8159
alpha	5.4154	5.4254	5.4352	5.4820	5.4908	5.5326	5.5326	5.5404	5.5164	5.4908	5.4729	5.4544
util living area	0.9988	0.9975	0.9931	0.9750	0.9143	0.7669	0.5922	0.6508	0.8895	0.9859	0.9975	0.9991 (86)
MIT	19.8432	19.9658	20.1922	20.5005	20.7747	20.9428	20.9888	20.9816	20.8612	20.5038	20.1188	19.8211 (87)
Th 2	20.0431	20.0450	20.0470	20.0560	20.0577	20.0655	20.0655	20.0670	20.0625	20.0577	20.0542	20.0507 (88)
util rest of house	0.9984	0.9967	0.9905	0.9650	0.8793	0.6833	0.4746	0.5324	0.8314	0.9786	0.9965	0.9988 (89)
MIT 2	18.9821	19.1059	19.3328	19.6429	19.8990	20.0378	20.0625	20.0614	19.9808	19.6508	19.2665	18.9662 (90)
Living area fraction									fLA = Living area / (4) =			0.4955 (91)
MIT	19.4088	19.5320	19.7586	20.0679	20.3329	20.4862	20.5215	20.5174	20.4170	20.0735	19.6888	19.3898 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4088	19.5320	19.7586	20.0679	20.3329	20.4862	20.5215	20.5174	20.4170	20.0735	19.6888	19.3898 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9980	0.9960	0.9896	0.9652	0.8907	0.7231	0.5334	0.5916	0.8561	0.9788	0.9960	0.9985 (94)
Ext temp.	307.0533	341.8536	378.5235	409.3140	399.8911	317.6507	223.4951	231.8732	307.1307	312.5154	294.3907	292.4120 (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	898.0776	867.7748	784.5830	653.9634	504.5244	340.8366	227.0684	238.0031	367.0914	553.6497	738.6595	894.9859 (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	439.7221	353.4191	302.1083	176.1476	77.8472	0.0000	0.0000	0.0000	0.0000	179.4039	319.8735	448.3150 (98)
Space heating per m2												2296.8367 (98)
												(98) / (4) = 40.5157 (99)

8c. Space cooling requirement

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

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8757	0.9353	0.9143	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	476.6557	400.7847	401.6498	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	584.9914	560.0106	529.7068	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	78.0017	118.4641	95.2744	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												291.7403 (104)
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)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	19.5004	29.6160	23.8186	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												72.9351 (107)
Space cooling per m2												1.2866 (108)
Energy for space heating												40.5157 (99)
Energy for space cooling												1.2866 (108)
Total												41.8023 (109)
Target Fabric Energy Efficiency (TFEE)												48.1 (109)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =									Air changes per hour			
Pressure test								0.0000 / (5) =	0.0000	(8)		
Measured/design AP50								Yes	3.7100			
Infiltration rate									0.1855	(18)		
Number of sides sheltered									3	(19)		
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.7750	(20)		
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.1438	(21)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1510	0.1438	0.1438	0.1330	0.1330	0.1186	0.1222	0.1150	0.1186	0.1258	0.1258	0.1366 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross 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			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Flat Roof	56.6900		56.6900	0.1500	8.5035		(30)
Total net area of external elements Aum(A, m2)			105.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	28.7323		(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1809 (36)
Total fabric heat loss						(33) + (36) =	37.9132 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8867 (42)
Average daily hot water use (litres/day)													79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)	
Energy content (annual)	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)	
Energy content (annual)	Total = Sum(45)m =												1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (46)	

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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	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169 (61)
Total heat required for water heating calculated for each month												
	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343 (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												
	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343 (64)
Total per year (kWh/year) = Sum(64)m =												1407.4652 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060 (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	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2250	36.6157	29.7779	22.5438	16.8517	14.2269	15.3727	19.9820	26.8198	34.0539	39.7460	42.3707	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.5655	248.1137	241.6923	228.0220	210.7656	194.5470	183.7120	181.1638	187.5852	201.2556	218.5119	234.7305	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	62.3123	60.4811	56.6825	51.5199	48.1676	43.4489	39.4403	44.5787	46.4061	51.7491	57.7827	60.4920	(72)
Total internal gains	438.0430	434.1508	417.0929	391.0259	364.7251	341.1631	327.4653	334.6648	349.7513	375.9989	404.9808	426.5335	(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				6.4200	22.3313		0.4500		0.0000		0.7700		49.6767 (76)

Solar gains	49.6767	87.4133	141.9438	212.7330	253.4804	277.4807	261.3980	229.9683	178.7458	110.6885	63.4559	40.4553	(83)
Total gains	487.7197	521.5641	559.0367	603.7589	618.2055	618.6438	588.8633	564.6330	528.4972	486.6874	468.4367	466.9888	(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	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	
alpha	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	
util living area	0.9866	0.9795	0.9552	0.8828	0.7235	0.4824	0.3173	0.3414	0.6358	0.8994	0.9735	0.9890	(86)
MIT	20.1947	20.2954	20.5172	20.7695	20.9400	20.9943	20.9995	20.9993	20.9763	20.7818	20.4469	20.1621	(87)
Th 2	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	(88)
util rest of house	0.9824	0.9731	0.9410	0.8478	0.6547	0.3916	0.2183	0.2383	0.5411	0.8606	0.9637	0.9855	(89)
MIT 2	19.3195	19.4181	19.6321	19.8621	19.9967	20.0280	20.0296	20.0296	20.0204	19.8783	19.5674	19.2876	(90)
Living area fraction	19.7532	19.8528	20.0706	20.3117	20.4641	20.5068	20.5102	20.5101	20.4940	20.3260	20.0032	19.7209	(92)
MIT	19.7532	19.8528	20.0706	20.3117	20.4641	20.5068	20.5102	20.5101	20.4940	20.3260	20.0032	19.7209	(91)
Temperature adjustment	19.6032	19.7028	19.9206	20.1617	20.3141	20.3568	20.3602	20.3601	20.3440	20.1760	19.8532	19.5709	(93)
adjusted MIT	19.6032	19.7028	19.9206	20.1617	20.3141	20.3568	20.3602	20.3601	20.3440	20.1760	19.8532	19.5709	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9801	0.9705	0.9391	0.8531	0.6759	0.4226	0.2521	0.2735	0.5729	0.8673	0.9615	0.9833	(94)
Ext temp.	478.0260	506.1707	525.0036	515.0386	417.8570	261.4232	148.4352	154.4241	302.7903	422.0847	450.4215	459.2096	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Month fracti	875.4462	851.2791	755.7755	619.4204	441.4998	262.9887	148.5054	154.5340	310.5053	517.6656	715.4875	873.5002	(97)
Space heating kWh	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)
RHI space heating demand	295.6807	231.9129	171.6943	75.1549	17.5902	0.0000	0.0000	0.0000	0.0000	71.1122	190.8475	308.2322	(98)
												1362.2248	(98)
												1362	(98)

FULL SAP CALCULATION PRINTOUT

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (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					0 * 10 = 0.0000 (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					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.7100
Number of sides sheltered					0.1855 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1438 (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	0.1833	0.1797	0.1761	0.1581	0.1545	0.1366	0.1366	0.1330	0.1438	0.1545	0.1617	0.1689 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Flat Roof	56.6900		56.6900	0.1500	8.5035		(30)
Total net area of external elements Aum(A, m ²)			105.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7323		(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1809 (36)
Total fabric heat loss						(33) + (36) =	37.9132 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492 (38)
Heat transfer coeff	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624 (39)
Average = Sum(39)m / 12 =												60.3624 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648	1.0648 (40)
HLP (average)												1.0648 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)										Total = Sum(45)m =		1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (46)

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Calculation Type: New Build (As Built)

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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	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169	(61)
Total heat required for water heating calculated for each month	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Heat gains from water heating, kWh/month	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060	(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	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2250	36.6157	29.7779	22.5438	16.8517	14.2269	15.3727	19.9820	26.8198	34.0539	39.7460	42.3707	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.5655	248.1137	241.6923	228.0220	210.7656	194.5470	183.7120	181.1638	187.5852	201.2556	218.5119	234.7305	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	62.3123	60.4811	56.6825	51.5199	48.1676	43.4489	39.4403	44.5787	46.4061	51.7491	57.7827	60.4920	(72)
Total internal gains	438.0430	434.1508	417.0929	391.0259	364.7251	341.1631	327.4653	334.6648	349.7513	375.9989	404.9808	426.5335	(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					6.4200	19.6403		0.4500	0.0000		0.7700		43.6904 (76)	
Solar gains	43.6904	85.4676	140.7530	205.2798	251.5781	257.5350	245.1838	210.6093	163.7015	101.4145	54.4767	35.9288	(83)	
Total gains	481.7334	519.6184	557.8459	596.3057	616.3033	598.6981	572.6491	545.2740	513.4529	477.4134	459.4576	462.4623	(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	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195		
alpha	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480		
util living area	0.9898	0.9833	0.9654	0.9143	0.8007	0.6218	0.4597	0.5024	0.7431	0.9328	0.9815	0.9918	(86)	
MIT	20.1061	20.2244	20.4334	20.6884	20.8857	20.9764	20.9960	20.9937	20.9412	20.6930	20.3470	20.0653	(87)	
Th 2	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	(88)	
util rest of house	0.9867	0.9783	0.9547	0.8881	0.7461	0.5373	0.3605	0.4000	0.6630	0.9064	0.9749	0.9892	(89)	
MIT 2	19.2318	19.3483	19.5516	19.7903	19.9574	20.0195	20.0287	20.0280	20.0002	19.8000	19.4701	19.1916	(90)	
Living area fraction										fLA = Living area / (4) =		0.4955	(91)	
MIT	19.6650	19.7824	19.9885	20.2353	20.4174	20.4937	20.5080	20.5065	20.4665	20.2425	19.9046	19.6246	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.5150	19.6324	19.8385	20.0853	20.2674	20.3437	20.3580	20.3565	20.3165	20.0925	19.7546	19.4746	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9847	0.9757	0.9522	0.8898	0.7604	0.5655	0.3944	0.4350	0.6882	0.9084	0.9726	0.9874	(94)
Ext temp.	474.3451	506.9986	531.1714	530.5900	468.6600	338.5897	225.8731	237.1929	353.3740	433.6686	446.8800	456.6335	(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	918.4160	889.2848	805.1463	675.1731	517.1464	346.7008	226.8440	238.8248	375.2422	572.9898	763.8631	922.0090	(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	330.3888	256.8963	203.8373	104.0998	36.0738	0.0000	0.0000	0.0000	0.0000	103.6550	228.2278	346.2394	(98)
Space heating per m2												1609.4182	(98)
												28.3898	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF ENERGY RATINGS 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													1778.3626 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	330.3888	256.8963	203.8373	104.0998	36.0738	0.0000	0.0000	0.0000	0.0000	103.6550	228.2278	346.2394	(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)	365.0704	283.8633	225.2346	115.0275	39.8606	0.0000	0.0000	0.0000	0.0000	114.5359	252.1854	382.5849	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Efficiency of water heater (217)m	89.5093	89.4249	89.2246	88.7923	88.0625	87.3000	87.3000	87.3000	87.3000	88.7594	89.3207	87.3000	(216)
Fuel for water heating, kWh/month	159.6588	140.2011	146.0376	129.4164	126.3146	111.5964	105.0374	118.2152	118.9384	134.3602	143.8455	155.0175	(219)
Water heating fuel used													1588.6391 (219)
Annual totals kWh/year													
Space heating fuel - main system													1778.3626 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													30.5419 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													105.5419 (231)
Electricity for lighting (calculated in Appendix L)													291.2184 (232)
Total delivered energy for all uses													3763.7619 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1778.3626	3.4800	61.8870 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1588.6391	3.4800	55.2846 (247)
Mechanical ventilation fans	30.5419	13.1900	4.0285 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	291.2184	13.1900	38.4117 (250)
Additional standing charges			120.0000 (251)
Total energy cost			289.5043 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1957 (257)
SAP value		83.3198
SAP rating (Section 12)		83 (258)
SAP band		B

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	1778.3626	0.2160	384.1263 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1588.6391	0.2160	343.1460 (264)
Space and water heating			727.2724 (265)
Pumps and fans	105.5419	0.5190	54.7762 (267)
Energy for lighting	291.2184	0.5190	151.1423 (268)
Total kg/year			933.1909 (272)
CO2 emissions per m2			16.4600 (273)
EI value			87.7031
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8849 = 3.933$, stars = 4
Water heating environmental impact	$0.216 / 0.8849 = 0.2441$, stars = 4

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CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (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					0 * 10 = 0.0000 (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) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.7100
Infiltration rate					0.1855 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1438 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1510	0.1438	0.1438	0.1330	0.1330	0.1186	0.1222	0.1150	0.1186	0.1258	0.1258	0.1366 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross 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			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Flat Roof	56.6900		56.6900	0.1500	8.5035		(30)
Total net area of external elements Aum(A, m2)			105.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.7323	(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1809 (36)
Total fabric heat loss							(33) + (36) = 37.9132 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492 (38)
Heat transfer coeff	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624	60.3624 (39)
Average = Sum(39)m / 12 =												60.3624 (39)
HLP	Jan 1.0648	Feb 1.0648	Mar 1.0648	Apr 1.0648	May 1.0648	Jun 1.0648	Jul 1.0648	Aug 1.0648	Sep 1.0648	Oct 1.0648	Nov 1.0648	Dec 1.0648 (40)
HLP (average)												1.0648 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
Daily hot water use	Jan 86.9094	Feb 83.7491	Mar 80.5887	Apr 77.4284	May 74.2680	Jun 71.1077	Jul 71.1077	Aug 74.2680	Sep 77.4284	Oct 80.5887	Nov 83.7491	Dec 86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)												Total = Sum(45)m = 1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

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	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169	(61)
Total heat required for water heating calculated for each month	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Heat gains from water heating, kWh/month	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2250	36.6157	29.7779	22.5438	16.8517	14.2269	15.3727	19.9820	26.8198	34.0539	39.7460	42.3707	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.5655	248.1137	241.6923	228.0220	210.7656	194.5470	183.7120	181.1638	187.5852	201.2556	218.5119	234.7305	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	62.3123	60.4811	56.6825	51.5199	48.1676	43.4489	39.4403	44.5787	46.4061	51.7491	57.7827	60.4920	(72)
Total internal gains	438.0430	434.1508	417.0929	391.0259	364.7251	341.1631	327.4653	334.6648	349.7513	375.9989	404.9808	426.5335	(73)

6. Solar gains													
[Jan]													
	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
East	6.4200	22.3313	0.4500	0.0000	0.7700	49.6767	(76)						
Solar gains	49.6767	87.4133	141.9438	212.7330	253.4804	277.4807	261.3980	229.9683	178.7458	110.6885	63.4559	40.4553	(83)
Total gains	487.7197	521.5641	559.0367	603.7589	618.2055	618.6438	588.8633	564.6330	528.4972	486.6874	468.4367	466.9888	(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	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	65.2195	
alpha	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	5.3480	
util living area	0.9866	0.9795	0.9552	0.8828	0.7235	0.4824	0.3173	0.3414	0.6358	0.8994	0.9735	0.9890	(86)
MIT	20.1947	20.2954	20.5172	20.7695	20.9400	20.9943	20.9995	20.9993	20.9763	20.7818	20.4469	20.1621	(87)
Th 2	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	20.0297	(88)
util rest of house	0.9824	0.9731	0.9410	0.8478	0.6547	0.3916	0.2183	0.2383	0.5411	0.8606	0.9637	0.9855	(89)
MIT 2	19.3195	19.4181	19.6321	19.8621	19.9967	20.0280	20.0296	20.0296	20.0204	19.8783	19.5674	19.2876	(90)
Living area fraction									fLA = Living area / (4) =			0.4955	(91)
MIT	19.7532	19.8528	20.0706	20.3117	20.4641	20.5068	20.5102	20.5101	20.4940	20.3260	20.0032	19.7209	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6032	19.7028	19.9206	20.1617	20.3141	20.3568	20.3602	20.3601	20.3440	20.1760	19.8532	19.5709	(93)

8. Space heating requirement													
Utilisation	0.9801	0.9705	0.9391	0.8531	0.6759	0.4226	0.2521	0.2735	0.5729	0.8673	0.9615	0.9833	(94)
Useful gains	478.0260	506.1707	525.0036	515.0386	417.8570	261.4232	148.4352	154.4241	302.7903	422.0847	450.4215	459.2096	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	875.4462	851.2791	755.7755	619.4204	441.4998	262.9887	148.5054	154.5340	310.5053	517.6656	715.4875	873.5002	(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	295.6807	231.9129	171.6943	75.1549	17.5902	0.0000	0.0000	0.0000	0.0000	71.1122	190.8475	308.2322	(98)
Space heating												1362.2248	(98)
Space heating per m2										(98) / (4) =		24.0294	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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													1505.2208 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	295.6807	231.9129	171.6943	75.1549	17.5902	0.0000	0.0000	0.0000	0.0000	71.1122	190.8475	308.2322	(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)	326.7190	256.2573	189.7174	83.0440	19.4367	0.0000	0.0000	0.0000	0.0000	78.5770	210.8812	340.5880	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Efficiency of water heater (217)m	89.4319	89.3507	89.0910	88.5379	87.7235	87.3000	87.3000	87.3000	87.3000	88.4685	89.1847	87.3000	(216)
Fuel for water heating, kWh/month	159.7971	140.3176	146.2567	129.7883	126.8027	111.5964	105.0374	118.2152	118.9384	134.8020	144.0649	155.1544	(219)
Water heating fuel used												1590.7709	(219)
Annual totals kWh/year													
Space heating fuel - main system												1505.2208	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													30.5419 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													105.5419 (231)
Electricity for lighting (calculated in Appendix L)													291.2184 (232)
Total delivered energy for all uses													3492.7519 (238)

10a. Fuel costs - using BEDF prices (488)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1505.2208	3.6300	54.6395 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1590.7709	3.6300	57.7450 (247)
Mechanical ventilation fans	30.5419	19.4400	5.9373 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	291.2184	19.4400	56.6129 (250)
Additional standing charges			95.0000 (251)
Total energy cost			284.5147 (255)

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	1505.2208	0.2160	325.1277 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1590.7709	0.2160	343.6065 (264)
Space and water heating			668.7342 (265)
Pumps and fans	105.5419	0.5190	54.7762 (267)
Energy for lighting	291.2184	0.5190	151.1423 (268)
Total kg/year			874.6528 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1505.2208	1.2200	1836.3693 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1590.7709	1.2200	1940.7405 (264)
Space and water heating			3777.1098 (265)
Pumps and fans	105.5419	3.0700	324.0135 (267)
Energy for lighting	291.2184	3.0700	894.0404 (268)
Primary energy kWh/year			4995.1637 (272)
Primary energy kWh/m2/year			88.1137 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 488 TEST (12 Jan 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£77	£77	£0
Mains gas	£207	£207	£0
Space heating	£170	£170	£0
Water heating	£58	£58	£0
Lighting	£57	£57	£0
Total cost of fuels	£284	£284	£0
Total cost of uses	£285	£285	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	88 kWh/m²	88 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Built) 9.92

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	269.39 (P1)
Transmission heat loss coefficient	37.91 (P7)
Summer heat loss coefficient	307.30 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
East	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
East	1.000	0.90	1.000 0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b
			FF Specific data or Table 6c
East	6.4200	117.5071	0.4500 0.0000
total:			0.9000 305.5301
			305.5301

Solar gains	Jun	Jul	Aug	
Internal gains	324	306	269	(P4)
Total summer gains	338	324	332	(P5)
	662	630	600	
Summer gain/loss ratio	2.16	2.05	1.95	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.41	20.20	20.00	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			