

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025c_051_As_Built				Issued on Date	28/06/2021
Assessment Reference	001	Prop Type Ref	GFF			
Property						
SAP Rating	85 B	DER	15.65	TER	17.05	
Environmental	89 B	% DER<TER	8.20			
CO ₂ Emissions (t/year)	0.93	DFEE	37.71	TFEE	41.84	
General Requirements Compliance	Pass	% DFEE<TFEE	9.88			
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

Ground-floor flat, total floor area 72 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.05 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.30 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.30 (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: 4.10 (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): Medium OK
Based on:
Overshading: Average
Windows facing South: 11.19 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Floor U-value 0.10 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 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	72.1600 (1b)	x 2.4000 (2b)	= 173.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.1840 (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					4.1000
Infiltration rate					0.2050 (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) =				0.1743 (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	0.2222	0.2178	0.2135	0.1917	0.1873	0.1655	0.1655	0.1612	0.1743	0.1873	0.1960	0.2047 (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 2 (Uw = 1.30)			11.1900	1.2357	13.8279		(27)
Heat Loss Floor			72.1600	0.1000	7.2160		(28a)
WT-E-01	37.8000	11.1900	26.6100	0.2000	5.3220		(29a)
Common	10.8000		10.8000	0.2994	3.2332		(29a)
WT-I-11	21.7900		21.7900	0.2719	5.9248		(29a)
Total net area of external elements Aum(A, m2)			142.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5240		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			72.1600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.8176 (36)
Total fabric heat loss							(33) + (36) = 48.3416 (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	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754 (38)
Heat transfer coeff	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170 (39)
Average = Sum(39)m / 12 =												76.9170 (39)
HLP	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659 (40)
HLP (average)												1.0659 (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												2.2974 (42)
Average daily hot water use (litres/day)												88.7633 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.6396	94.0891	90.5386	86.9880	83.4375	79.8870	79.8870	83.4375	86.9880	90.5386	94.0891	97.6396 (44)
Energy conte	144.7967	126.6401	130.6813	113.9311	109.3196	94.3345	87.4148	100.3098	101.5078	118.2975	129.1310	140.2279 (45)
Energy content (annual)												Total = Sum(45)m = 1396.5922 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7195	18.9960	19.6022	17.0897	16.3979	14.1502	13.1122	15.0465	15.2262	17.7446	19.3696	21.0342 (46)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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	14.0959	12.7113	14.0405	13.5507	13.9755	13.4937	13.9242	13.9574	13.5247	14.0136	13.6044	14.0852	(61)
Total heat required for water heating calculated for each month	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131	(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	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131	(64)
Heat gains from water heating, kWh/month	51.6689	45.2857	46.9617	41.2698	39.8426	34.7396	32.5465	36.8424	37.1325	42.8373	46.3372	50.1471	(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	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9328	16.8160	13.6757	10.3534	7.7393	6.5338	7.0600	9.1769	12.3172	15.6395	18.2536	19.4591	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.2849	204.3840	199.0944	187.8334	173.6184	160.2584	151.3330	149.2339	154.5236	165.7845	179.9995	193.3596	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	(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)	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	(71)
Water heating gains (Table 5)	69.4474	67.3894	63.1205	57.3191	53.5519	48.2495	43.7452	49.5193	51.5729	57.5771	64.3572	67.4020	(72)
Total internal gains	351.1262	349.0504	336.3516	315.9669	295.3707	275.5027	262.5993	268.3911	278.8747	299.4621	323.0713	340.6816	(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

South				11.1900	46.7521	0.4500	0.0000			0.7700			181.2734 (78)

Solar gains	181.2734	296.8791	378.1714	427.4157	445.3936	428.6308	418.7984	406.7112	395.0446	320.2120	214.8708	156.6369	(83)
Total gains	532.3996	645.9296	714.5230	743.3827	740.7643	704.1335	681.3977	675.1023	673.9193	619.6741	537.9421	497.3186	(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	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496		
alpha	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433		
util living area	0.9947	0.9850	0.9646	0.9203	0.8273	0.6645	0.4907	0.5161	0.7277	0.9282	0.9872	0.9962	(86)	
MIT	20.0022	20.2041	20.4369	20.6741	20.8645	20.9678	20.9946	20.9928	20.9467	20.7029	20.2888	19.9469	(87)	
Th 2	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	(88)	
util rest of house	0.9930	0.9804	0.9537	0.8953	0.7754	0.5777	0.3856	0.4113	0.6470	0.9005	0.9824	0.9950	(89)	
MIT 2	19.1285	19.3277	19.5541	19.7770	19.9413	20.0145	20.0274	20.0268	20.0024	19.8078	19.4129	19.0736	(90)	
Living area fraction										fLA = Living area / (4) =		0.3672	(91)	
MIT	19.4493	19.6496	19.8783	20.1065	20.2803	20.3646	20.3826	20.3816	20.3492	20.1365	19.7345	19.3943	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.2993	19.4996	19.7283	19.9565	20.1303	20.2146	20.2326	20.2316	20.1992	19.9865	19.5845	19.2443	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9913	0.9772	0.9496	0.8931	0.7814	0.5951	0.4080	0.4336	0.6622	0.8991	0.9796	0.9937	(94)
Useful gains	527.7642	631.1985	678.5149	663.9441	578.8380	419.0249	277.9964	292.7223	446.2518	557.1422	526.9662	494.1923	(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	1153.7025	1122.9542	1017.4772	850.4295	648.4336	431.8546	279.4085	294.7134	469.1288	721.9812	960.2736	1157.1630	(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	465.6981	330.4598	252.1880	134.2695	51.7792	0.0000	0.0000	0.0000	0.0000	122.6403	311.9813	493.2502	(98)
Space heating												2162.2663	(98)
Space heating per m2												29.9649	(99)

8c. Space cooling requirement

Not applicable

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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													2389.2446 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	465.6981	330.4598	252.1880	134.2695	51.7792	0.0000	0.0000	0.0000	0.0000	122.6403	311.9813	493.2502	(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)	514.5835	365.1490	278.6607	148.3641	57.2146	0.0000	0.0000	0.0000	0.0000	135.5141	344.7308	545.0278	(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	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131	(64)
Efficiency of water heater (217)m	89.6639	89.5266	89.3064	88.9127	88.2226	87.3000	87.3000	87.3000	87.3000	88.8106	89.4705	87.3000	(216)
Fuel for water heating, kWh/month	177.2091	155.6536	162.0509	143.3786	139.7545	123.5145	116.0813	130.8902	131.7669	148.9813	159.5334	172.0011	(219)
Water heating fuel used												1760.8154	(219)
Annual totals kWh/year													
Space heating fuel - main system												2389.2446	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.8763 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.8763 (231)
Electricity for lighting (calculated in Appendix L)													334.3600 (232)
Total delivered energy for all uses													4598.2963 (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	2389.2446	0.2160	516.0768	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1760.8154	0.2160	380.3361	(264)
Space and water heating			896.4129	(265)
Pumps and fans	113.8763	0.5190	59.1018	(267)
Energy for lighting	334.3600	0.5190	173.5329	(268)
Total CO2, kg/year			1129.0476	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6500	(273)

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

DER			15.6500	ZC1
Total Floor Area		TFA	72.1600	
Assumed number of occupants		N	2.2974	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6117	ZC2
CO2 emissions from cooking, equation (L16)			2.4132	ZC3
Total CO2 emissions			34.6749	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			34.6749	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	72.1600 (1b)	x 2.4000 (2b)	= 173.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.1840 (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) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1732 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4232 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3597 (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	0.4587	0.4497	0.4407	0.3957	0.3867	0.3418	0.3418	0.3328	0.3597	0.3867	0.4047	0.4227 (22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893 (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 Opening Type (Uw = 1.40)			11.1900	1.3258	14.8352		(27)
Heat Loss Floor			72.1600	0.1300	9.3808		(28a)
WT-E-01	37.8000	11.1900	26.6100	0.1800	4.7898		(29a)
Common	10.8000		10.8000	0.1800	1.9440		(29a)
WT-I-11	21.7900		21.7900	0.1800	3.9222		(29a)
Total net area of external elements Aum(A, m ²)			142.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8720		(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)							8.7279 (36)
Total fabric heat loss						(33) + (36) =	43.5999 (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	34.5870	34.3536	34.1248	33.0500	32.8489	31.9129	31.9129	31.7395	32.2734	32.8489	33.2557	33.6810 (38)
Heat transfer coeff	78.1870	77.9535	77.7247	76.6499	76.4489	75.5128	75.5128	75.3394	75.8734	76.4489	76.8557	77.2809 (39)
Average = Sum(39)m / 12 =												76.6490 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0835	1.0803	1.0771	1.0622	1.0594	1.0465	1.0465	1.0441	1.0515	1.0594	1.0651	1.0710 (40)
HLP (average)												1.0622 (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												2.2974 (42)
Average daily hot water use (litres/day)												88.7633 (43)
Daily hot water use	97.6396	94.0891	90.5386	86.9880	83.4375	79.8870	79.8870	83.4375	86.9880	90.5386	94.0891	97.6396 (44)
Energy conte	144.7967	126.6401	130.6813	113.9311	109.3196	94.3345	87.4148	100.3098	101.5078	118.2975	129.1310	140.2279 (45)
Energy content (annual)										Total = Sum(45)m =		1396.5922 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7195	18.9960	19.6022	17.0897	16.3979	14.1502	13.1122	15.0465	15.2262	17.7446	19.3696	21.0342 (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	49.7561	43.3068	46.1375	42.8982	42.5188	39.3963	40.7095	42.5188	42.8982	46.1375	46.4001	49.7561 (61)
Total heat required for water heating calculated for each month	194.5528	169.9469	176.8187	156.8293	151.8384	133.7308	128.1243	142.8286	144.4060	164.4350	175.5311	189.9840 (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	194.5528	169.9469	176.8187	156.8293	151.8384	133.7308	128.1243	142.8286	144.4060	164.4350	175.5311	189.9840 (64)
Heat gains from water heating, kWh/month	60.5839	52.9345	54.9859	48.6066	46.9785	41.2153	39.2428	43.9827	44.4759	50.8683	54.5361	59.0648 (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	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9328	16.8160	13.6757	10.3534	7.7393	6.5338	7.0600	9.1769	12.3172	15.6395	18.2536	19.4591	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.2849	204.3840	199.0944	187.8334	173.6184	160.2584	151.3330	149.2339	154.5236	165.7845	179.9995	193.3596	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	(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)	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	(71)
Water heating gains (Table 5)	81.4300	78.7716	73.9058	67.5092	63.1431	57.2435	52.7457	59.1165	61.7721	68.3714	75.7446	79.3882	(72)
Total internal gains	363.1088	360.4327	347.1369	326.1570	304.9618	284.4967	271.5998	277.9884	289.0738	310.2564	334.4587	352.6678	(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
South				11.1900	46.7521	0.6300		0.7000		0.7700		159.8832 (78)
Solar gains	159.8832	261.8474	333.5472	376.9807	392.8372	378.0524	369.3802	358.7193	348.4294	282.4270	189.5161	138.1538 (83)
Total gains	522.9920	622.2801	680.6840	703.1377	697.7990	662.5490	640.9799	636.7077	637.5032	592.6834	523.9748	490.8216 (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	64.0914	64.2833	64.4726	65.3766	65.5485	66.3611	66.3611	66.5138	66.0457	65.5485	65.2016	64.8428	
alpha	5.2728	5.2856	5.2982	5.3584	5.3699	5.4241	5.4241	5.4343	5.4030	5.3699	5.3468	5.3229	
util living area	0.9952	0.9875	0.9714	0.9338	0.8508	0.6884	0.5112	0.5350	0.7505	0.9379	0.9886	0.9965	(86)
MIT	19.9655	20.1556	20.3856	20.6417	20.8448	20.9639	20.9939	20.9922	20.9403	20.6835	20.2725	19.9314	(87)
Th 2	20.0143	20.0170	20.0196	20.0318	20.0341	20.0448	20.0448	20.0468	20.0407	20.0341	20.0295	20.0246	(88)
util rest of house	0.9936	0.9836	0.9623	0.9119	0.8023	0.6020	0.4040	0.4290	0.6713	0.9130	0.9843	0.9953	(89)
MIT 2	18.6462	18.9234	19.2549	19.6210	19.8843	20.0209	20.0425	20.0436	19.9965	19.6850	19.1040	18.6042	(90)
Living area fraction									fLA = Living area / (4) =			0.3672	(91)
MIT	19.1307	19.3759	19.6702	19.9958	20.2370	20.3672	20.3919	20.3920	20.3431	20.0516	19.5332	19.0916	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1307	19.3759	19.6702	19.9958	20.2370	20.3672	20.3919	20.3920	20.3431	20.0516	19.5332	19.0916	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9917	0.9802	0.9582	0.9109	0.8135	0.6325	0.4436	0.4681	0.6979	0.9135	0.9814	0.9938	(94)
Ext temp.	518.6501	609.9793	652.2545	640.5065	567.6612	419.0616	284.3239	298.0355	444.9344	541.4104	514.2341	487.7911	(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	1159.5673	1128.4499	1023.6462	850.4935	652.6455	435.4980	286.3378	300.7515	473.6841	722.5678	955.5587	1150.8381	(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	476.8424	348.4122	276.3154	151.1906	63.2283	0.0000	0.0000	0.0000	0.0000	134.7811	317.7537	493.3070	(98)
												2261.8307	(98)
												31.3447	(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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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													2421.6603 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	476.8424	348.4122	276.3154	151.1906	63.2283	0.0000	0.0000	0.0000	0.0000	134.7811	317.7537	493.3070	(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)	510.5379	373.0323	295.8409	161.8743	67.6963	0.0000	0.0000	0.0000	0.0000	144.3053	340.2074	528.1660	(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	194.5528	169.9469	176.8187	156.8293	151.8384	133.7308	128.1243	142.8286	144.4060	164.4350	175.5311	189.9840	(64)
Efficiency of water heater (217)m	87.2210	86.8198	86.1707	84.9592	83.0272	80.3000	80.3000	80.3000	80.3000	84.5554	86.5273	87.3454	(216)
Fuel for water heating, kWh/month	223.0572	195.7467	205.1959	184.5937	182.8780	166.5390	159.5571	177.8687	179.8331	194.4702	202.8621	217.5089	(219)
Water heating fuel used												2290.1106	(219)
Annual totals kWh/year													
Space heating fuel - main system												2421.6603	(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)												334.3600	(232)
Total delivered energy for all uses												5121.1309	(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	2421.6603	0.2160	523.0786 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2290.1106	0.2160	494.6639 (264)
Space and water heating			1017.7425 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	334.3600	0.5190	173.5329 (268)
Total CO2, kg/m2/year			1230.2004 (272)
Emissions per m2 for space and water heating			14.1040 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4048 (272b)
Emissions per m2 for pumps and fans			0.5394 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1040 * 1.00) + 2.4048 + 0.5394, rounded to 2 d.p.			17.0500 (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	72.1600 (1b)	x 2.4000 (2b)	= 173.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.1840 (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) =	0.1732 (8)
Pressure test				Yes	
Measured/design AP50				4.1000	
Infiltration rate				0.3782	(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) =		0.3215 (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	0.4099	0.4019	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3778 (22b)
	0.5840	0.5807	0.5776	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713 (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 2 (Uw = 1.30)			11.1900	1.2357	13.8279		(27)
Heat Loss Floor			72.1600	0.1000	7.2160		(28a)
WT-E-01	37.8000	11.1900	26.6100	0.2000	5.3220		(29a)
Common	10.8000		10.8000	0.2994	3.2332		(29a)
WT-I-11	21.7900		21.7900	0.2719	5.9248		(29a)
Total net area of external elements Aum(A, m ²)			142.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5240		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			72.1600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.8176 (36)
Total fabric heat loss						(33) + (36) =	48.3416 (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	33.3766	33.1902	33.0074	32.1491	31.9885	31.2409	31.2409	31.1024	31.5288	31.9885	32.3133	32.6530 (38)
Heat transfer coeff	81.7182	81.5318	81.3490	80.4907	80.3301	79.5825	79.5825	79.4440	79.8704	80.3301	80.6549	80.9946 (39)
Average = Sum(39)m / 12 =												80.4899 (39)
HLP	1.1325	1.1299	1.1273	1.1154	1.1132	1.1029	1.1029	1.1009	1.1069	1.1132	1.1177	1.1224 (40)
HLP (average)												1.1154 (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												2.2974 (42)
Average daily hot water use (litres/day)												88.7633 (43)
Daily hot water use	97.6396	94.0891	90.5386	86.9880	83.4375	79.8870	79.8870	83.4375	86.9880	90.5386	94.0891	97.6396 (44)
Energy conte	144.7967	126.6401	130.6813	113.9311	109.3196	94.3345	87.4148	100.3098	101.5078	118.2975	129.1310	140.2279 (45)
Energy content (annual)										Total = Sum(45)m =		1396.5922 (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 Built)

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 (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	30.7693	26.9110	27.7698	24.2104	23.2304	20.0461	18.5756	21.3158	21.5704	25.1382	27.4403	29.7984 (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	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9328	16.8160	13.6757	10.3534	7.7393	6.5338	7.0600	9.1769	12.3172	15.6395	18.2536	19.4591	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.2849	204.3840	199.0944	187.8334	173.6184	160.2584	151.3330	149.2339	154.5236	165.7845	179.9995	193.3596	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	(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)	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	(71)
Water heating gains (Table 5)	41.3566	40.0462	37.3250	33.6255	31.2237	27.8418	24.9673	28.6503	29.9589	33.7879	38.1116	40.0517	(72)
Total internal gains	320.0354	318.7072	307.5561	289.2733	270.0424	252.0950	240.8213	244.5221	254.2607	272.6730	293.8257	310.3313	(73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Table 6b		Table 6c		factor		W	
			W/m2		or		or		Table 6d			
South	11.1900		46.7521		0.4500		0.0000		0.7700		181.2734 (78)	
Solar gains	181.2734	296.8791	378.1714	427.4157	445.3936	428.6308	418.7984	406.7112	395.0446	320.2120	214.8708	156.6369 (83)
Total gains	501.3088	615.5864	685.7274	716.6890	715.4360	680.7258	659.6197	651.2334	649.3053	592.8850	508.6965	466.9682 (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	61.3219	61.4621	61.6001	62.2571	62.3815	62.9675	62.9675	63.0773	62.7405	62.3815	62.1302	61.8697	
alpha	5.0881	5.0975	5.1067	5.1505	5.1588	5.1978	5.1978	5.2052	5.1827	5.1588	5.1420	5.1246	
util living area	0.9961	0.9887	0.9728	0.9359	0.8552	0.6982	0.5214	0.5486	0.7626	0.9437	0.9905	0.9973	(86)
MIT	19.8702	20.0803	20.3302	20.6029	20.8228	20.9553	20.9918	20.9893	20.9266	20.6385	20.1919	19.8293	(87)
Th 2	19.9744	19.9765	19.9786	19.9882	19.9901	19.9985	19.9985	20.0001	19.9952	19.9901	19.9864	19.9826	(88)
util rest of house	0.9948	0.9851	0.9639	0.9141	0.8062	0.6085	0.4077	0.4358	0.6815	0.9201	0.9869	0.9964	(89)
MIT 2	18.9532	19.1629	19.4094	19.6773	19.8732	19.9783	19.9965	19.9971	19.9580	19.7165	19.2829	18.9191	(90)
Living area fraction	19.2899	19.4998	19.7475	20.0172	20.2219	20.3371	20.3620	20.3615	20.3137	20.0550	19.6167	19.2533	(91)
MIT	19.2899	19.4998	19.7475	20.0172	20.2219	20.3371	20.3620	20.3615	20.3137	20.0550	19.6167	19.2533	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2899	19.4998	19.7475	20.0172	20.2219	20.3371	20.3620	20.3615	20.3137	20.0550	19.6167	19.2533	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	498.1528	605.0880	659.2643	655.6217	585.6633	435.9851	296.6744	310.9838	460.4373	546.5621	501.1466	464.8556	(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	1224.9496	1190.3509	1077.6749	894.8315	684.5683	456.5734	299.3885	314.7173	496.2948	759.5247	1009.5375	1219.2370	(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	540.7368	393.2966	311.2974	172.2311	73.5853	0.0000	0.0000	0.0000	0.0000	158.4442	366.0415	561.2598	(98)
Space heating												2576.8928	(98)
Space heating per m2												35.7108	(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	748.0752	588.9103	603.7746	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8989	0.9503	0.9438	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	672.4710	559.6135	569.8130	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	881.3948	855.0219	846.7363	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	150.4251	219.7838	206.0310	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												576.2399	(104)
Cooled fraction												1.0000	(105)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	37.6063	54.9460	51.5077	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											144.0600 (107)
Space cooling per m2											1.9964 (108)
Energy for space heating											35.7108 (99)
Energy for space cooling											1.9964 (108)
Total											37.7072 (109)
Dwelling Fabric Energy Efficiency (DFEE)											37.7 (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	72.1600 (1b)	x 2.4000 (2b)	= 173.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.1840 (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) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1732 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4232 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3597 (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												
	0.4587	0.4497	0.4407	0.3957	0.3867	0.3418	0.3418	0.3328	0.3597	0.3867	0.4047	0.4227 (22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893 (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 Opening Type (Uw = 1.40)			11.1900	1.3258	14.8352		(27)
Heat Loss Floor			72.1600	0.1300	9.3808		(28a)
WT-E-01	37.8000	11.1900	26.6100	0.1800	4.7898		(29a)
Common	10.8000		10.8000	0.1800	1.9440		(29a)
WT-I-11	21.7900		21.7900	0.1800	3.9222		(29a)
Total net area of external elements Aum(A, m ²)			142.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8720		(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)							8.7279 (36)
Total fabric heat loss						(33) + (36) =	43.5999 (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	34.5870	34.3536	34.1248	33.0500	32.8489	31.9129	31.9129	31.7395	32.2734	32.8489	33.2557	33.6810 (38)
Heat transfer coeff	78.1870	77.9535	77.7247	76.6499	76.4489	75.5128	75.5128	75.3394	75.8734	76.4489	76.8557	77.2809 (39)
Average = Sum(39)m / 12 =												76.6490 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0835	1.0803	1.0771	1.0622	1.0594	1.0465	1.0465	1.0441	1.0515	1.0594	1.0651	1.0710 (40)
HLP (average)												1.0622 (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												2.2974 (42)
Average daily hot water use (litres/day)												88.7633 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.6396	94.0891	90.5386	86.9880	83.4375	79.8870	79.8870	83.4375	86.9880	90.5386	94.0891	97.6396 (44)
Energy conte	144.7967	126.6401	130.6813	113.9311	109.3196	94.3345	87.4148	100.3098	101.5078	118.2975	129.1310	140.2279 (45)
Energy content (annual)										Total = Sum(45)m =		1396.5922 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As 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 (59)
Heat gains from water heating, kWh/month	30.7693	26.9110	27.7698	24.2104	23.2304	20.0461	18.5756	21.3158	21.5704	25.1382	27.4403	29.7984 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701	114.8701 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9328	16.8160	13.6757	10.3534	7.7393	6.5338	7.0600	9.1769	12.3172	15.6395	18.2536	19.4591 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.2849	204.3840	199.0944	187.8334	173.6184	160.2584	151.3330	149.2339	154.5236	165.7845	179.9995	193.3596 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870	34.4870 (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)	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961 (71)
Water heating gains (Table 5)	41.3566	40.0462	37.3250	33.6255	31.2237	27.8418	24.9673	28.6503	29.9589	33.7879	38.1116	40.0517 (72)
Total internal gains	320.0354	318.7072	307.5561	289.2733	270.0424	252.0950	240.8213	244.5221	254.2607	272.6730	293.8257	310.3313 (73)

6. Solar gains

[Jan]												
	Area											
	m2											
South	11.1900											
Solar gains	159.8832	261.8474	333.5472	376.9807	392.8372	378.0524	369.3802	358.7193	348.4294	282.4270	189.5161	138.1538 (83)
Total gains	479.9186	580.5546	641.1032	666.2540	662.8796	630.1473	610.2015	603.2414	602.6900	555.1000	483.3418	448.4851 (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	64.0914	64.2833	64.4726	65.3766	65.5485	66.3611	66.3611	66.5138	66.0457	65.5485	65.2016	64.8428
Feb	5.2728	5.2856	5.2982	5.3584	5.3699	5.4241	5.4241	5.4343	5.4030	5.3699	5.3468	5.3229
util living area	0.9968	0.9908	0.9777	0.9455	0.8710	0.7151	0.5351	0.5621	0.7789	0.9512	0.9921	0.9977 (86)
MIT	19.9100	20.1038	20.3402	20.6065	20.8232	20.9567	20.9924	20.9901	20.9283	20.6466	20.2217	19.8764 (87)
Th 2	20.0143	20.0170	20.0196	20.0318	20.0341	20.0448	20.0448	20.0468	20.0407	20.0341	20.0295	20.0246 (88)
util rest of house	0.9957	0.9878	0.9702	0.9265	0.8258	0.6286	0.4239	0.4520	0.7014	0.9304	0.9890	0.9970 (89)
MIT 2	19.0252	19.2195	19.4540	19.7197	19.9154	20.0248	20.0428	20.0440	20.0035	19.7631	19.3478	19.0001 (90)
Living area fraction									fLA = Living area / (4) =			0.3672 (91)
MIT	19.3501	19.5443	19.7794	20.0454	20.2488	20.3670	20.3916	20.3914	20.3432	20.0876	19.6687	19.3219 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3501	19.5443	19.7794	20.0454	20.2488	20.3670	20.3916	20.3914	20.3432	20.0876	19.6687	19.3219 (93)

8. Space heating requirement

Utilisation	0.9947	0.9860	0.9680	0.9269	0.8370	0.6594	0.4651	0.4927	0.7277	0.9318	0.9875	0.9962 (94)
Useful gains	477.3986	572.4376	620.5970	617.5203	554.8116	415.4919	283.7848	297.2423	438.5852	517.2249	477.3097	446.7924 (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	1176.7228	1141.5721	1032.1405	854.2933	653.5437	435.4849	286.3118	300.7128	473.6896	725.3146	965.9747	1168.6382 (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	520.2972	382.4584	306.1884	170.4766	73.4567	0.0000	0.0000	0.0000	0.0000	154.8187	351.8388	537.0533 (98)
Space heating												2496.5880 (98)
Space heating per m2												(98) / (4) = 34.5979 (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	709.8202	558.7947	572.5798	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8992	0.9515	0.9454	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	638.2918	531.7182	541.3156	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	822.2771	797.2604	790.6418	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	132.4694	197.5633	185.4988	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												515.5315 (104)
Cooled fraction												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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.1174	49.3908	46.3747	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													128.8829 (107)
Space cooling per m2													1.7861 (108)
Energy for space heating													34.5979 (99)
Energy for space cooling													1.7861 (108)
Total													36.3840 (109)
Target Fabric Energy Efficiency (TFEE)													41.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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	72.1600 (1b)	x 2.4000 (2b)	= 173.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.1840 (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					4.1000
Infiltration rate					0.2050 (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) =				0.1743 (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	0.1830	0.1743	0.1743	0.1612	0.1612	0.1438	0.1481	0.1394	0.1438	0.1525	0.1525	0.1655 (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 2 (Uw = 1.30)			11.1900	1.2357	13.8279		(27)
Heat Loss Floor			72.1600	0.1000	7.2160		(28a)
WT-E-01	37.8000	11.1900	26.6100	0.2000	5.3220		(29a)
Common	10.8000		10.8000	0.2994	3.2332		(29a)
WT-I-11	21.7900		21.7900	0.2719	5.9248		(29a)
Total net area of external elements Aum(A, m2)			142.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5240		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			72.1600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.8176 (36)
Total fabric heat loss							(33) + (36) = 48.3416 (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	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754 (38)
Average = Sum(39)m / 12 =	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659 (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												2.2974 (42)
Average daily hot water use (litres/day)												88.7633 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.6396	94.0891	90.5386	86.9880	83.4375	79.8870	79.8870	83.4375	86.9880	90.5386	94.0891	97.6396 (44)
Energy conte	144.7967	126.6401	130.6813	113.9311	109.3196	94.3345	87.4148	100.3098	101.5078	118.2975	129.1310	140.2279 (45)
Energy content (annual)												
	Total = Sum(45)m =											1396.5922 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7195	18.9960	19.6022	17.0897	16.3979	14.1502	13.1122	15.0465	15.2262	17.7446	19.3696	21.0342 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 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	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)
Combi loss	14.0959	12.7113	14.0405	13.5507	13.9755	13.4937	13.9242	13.9574	13.5247	14.0136	13.6044	14.0852	14.0852	(61)
Total heat required for water heating calculated for each month	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131	154.3131	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131	154.3131	(64)
RHI water heating demand														
Heat gains from water heating, kWh/month	51.6689	45.2857	46.9617	41.2698	39.8426	34.7396	32.5465	36.8424	37.1325	42.8373	46.3372	50.1471	50.1471	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	137.8441	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3321	42.0400	34.1892	25.8834	19.3482	16.3345	17.6500	22.9422	30.7930	39.0987	45.6340	48.6476	48.6476	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.9178	305.0508	297.1558	280.3484	259.1320	239.1916	225.8702	222.7372	230.6322	247.4396	268.6560	288.5964	288.5964	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	51.0818	(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)	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	-91.8961	(71)
Water heating gains (Table 5)	69.4474	67.3894	63.1205	57.3191	53.5519	48.2495	43.7452	49.5193	51.5729	57.5771	64.3572	67.4020	67.4020	(72)
Total internal gains	518.7272	514.5100	494.4954	463.5807	432.0619	403.8055	387.2953	395.2285	413.0279	444.1453	478.6770	504.6758	504.6758	(73)

6. Solar gains

[Jan]														
South	11.1900	50.9848	0.4500	0.0000	0.7700	197.6852	(78)							
Solar gains	197.6852	290.5527	365.0073	426.6125	436.0915	450.9755	435.0602	429.2461	413.5628	334.2700	239.8575	169.3165	169.3165	(83)
Total gains	716.4124	805.0627	859.5027	890.1932	868.1534	854.7809	822.3555	824.4747	826.5907	778.4152	718.5345	673.9924	673.9924	(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	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	65.1496	
alpha	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	5.3433	
util living area	0.9754	0.9555	0.9124	0.8242	0.6718	0.4464	0.2897	0.2982	0.5303	0.8097	0.9451	0.9810	0.9810	0.9810	(86)
MIT	20.3072	20.4511	20.6538	20.8413	20.9576	20.9961	20.9997	20.9996	20.9897	20.8774	20.5760	20.2574	20.2574	20.2574	(87)
Th 2	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	20.0288	(88)
util rest of house	0.9682	0.9432	0.8890	0.7813	0.6031	0.3615	0.1991	0.2079	0.4459	0.7566	0.9276	0.9752	0.9752	0.9752	(89)
MIT 2	19.4278	19.5655	19.7549	19.9183	20.0062	20.0276	20.0287	20.0287	20.0250	19.9502	19.6868	19.3798	19.3798	19.3798	(90)
Living area fraction	19.7507	19.8907	20.0850	20.2573	20.3556	20.3833	20.3853	20.3853	20.3793	20.2907	20.0133	19.7021	19.7021	19.7021	(91)
MIT	19.7507	19.8907	20.0850	20.2573	20.3556	20.3833	20.3853	20.3853	20.3793	20.2907	20.0133	19.7021	19.7021	19.7021	(92)
Temperature adjustment	19.6007	19.7407	19.9350	20.1073	20.2056	20.2333	20.2353	20.2353	20.2293	20.1407	19.8633	19.5521	19.5521	19.5521	(93)

8. Space heating requirement

Utilisation	0.9643	0.9389	0.8865	0.7851	0.6161	0.3796	0.2184	0.2271	0.4636	0.7632	0.9240	0.9716	0.9716	0.9716	(94)
Useful gains	690.8009	755.8536	761.9393	698.8691	534.8915	324.4460	179.5834	187.2617	383.2476	594.1114	663.9478	654.8819	654.8819	654.8819	(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	5.1000	5.1000	(96)
Heat loss rate W	1115.3526	1087.6609	964.1541	785.1132	554.2306	325.6093	179.6248	187.3144	386.8364	656.9276	912.4912	1111.6106	1111.6106	1111.6106	(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	1.0000	1.0000	(97a)
Space heating kWh	315.8664	222.9745	150.4478	62.0958	14.3883	0.0000	0.0000	0.0000	0.0000	46.7353	178.9513	339.8062	339.8062	339.8062	(98)
Space heating															(98)
RHI space heating demand															(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.1600 (1b)	x 2.4000 (2b)	= 173.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.1840 (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					4.1000
Infiltration rate					0.2050 (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) =				0.1743 (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	0.2222	0.2178	0.2135	0.1917	0.1873	0.1655	0.1655	0.1612	0.1743	0.1873	0.1960	0.2047 (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 2 (Uw = 1.30)			11.1900	1.2357	13.8279		(27)
Heat Loss Floor			72.1600	0.1000	7.2160		(28a)
WT-E-01	37.8000	11.1900	26.6100	0.2000	5.3220		(29a)
Common	10.8000		10.8000	0.2994	3.2332		(29a)
WT-I-11	21.7900		21.7900	0.2719	5.9248		(29a)
Total net area of external elements Aum(A, m ²)			142.5500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.5240	(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			72.1600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.8176 (36)
Total fabric heat loss							(33) + (36) = 48.3416 (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	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754 (38)
Heat transfer coeff	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170 (39)
Average = Sum(39)m / 12 =												76.9170 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659 (40)
HLP (average)												1.0659 (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												2.2974 (42)
Average daily hot water use (litres/day)												88.7633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.6396	94.0891	90.5386	86.9880	83.4375	79.8870	79.8870	83.4375	86.9880	90.5386	94.0891	97.6396 (44)
Energy conte	144.7967	126.6401	130.6813	113.9311	109.3196	94.3345	87.4148	100.3098	101.5078	118.2975	129.1310	140.2279 (45)
Energy content (annual)												Total = Sum(45)m = 1396.5922 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7195	18.9960	19.6022	17.0897	16.3979	14.1502	13.1122	15.0465	15.2262	17.7446	19.3696	21.0342 (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	14.0959	12.7113	14.0405	13.5507	13.9755	13.4937	13.9242	13.9574	13.5247	14.0136	13.6044	14.0852 (61)
Total heat required for water heating calculated for each month												
	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131 (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 =				
Output from w/h	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131 (64)
								Total per year (kWh/year) = Sum(64)m =				
Heat gains from water heating, kWh/month	51.6689	45.2857	46.9617	41.2698	39.8426	34.7396	32.5465	36.8424	37.1325	42.8373	46.3372	50.1471 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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												1771.5064	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.3567	248.1071	179.3486	87.8329	30.0340	0.0000	0.0000	0.0000	0.0000	75.2496	228.3031	390.9814	(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)	401.4991	274.1514	198.1753	97.0529	33.1868	0.0000	0.0000	0.0000	0.0000	83.1487	252.2686	432.0236	(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													
Water heating requirement	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131	(64)
Efficiency of water heater	89.5019	89.3224	89.0424	88.5776	87.9089	87.3000	87.3000	87.3000	87.3000	88.4336	89.2416	87.3000	(216)
(217)m	89.5019	89.3224	89.0424	88.5776	87.9089	87.3000	87.3000	87.3000	87.3000	88.4336	89.2416	89.5709	(217)
Fuel for water heating, kWh/month	177.5300	156.0094	162.5313	143.9209	140.2533	123.5145	116.0813	130.8902	131.7669	149.6163	159.9426	172.2804	(219)
Water heating fuel used												1764.3371	(219)
Annual totals kWh/year													
Space heating fuel - main system												1771.5064	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)												38.8763	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												113.8763	(231)
Electricity for lighting (calculated in Appendix L)												334.3600	(232)
Total delivered energy for all uses												3984.0800	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1771.5064	3.4800	61.6484 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1764.3371	3.4800	61.3989 (247)
Mechanical ventilation fans	38.8763	13.1900	5.1278 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	334.3600	13.1900	44.1021 (250)
Additional standing charges			120.0000 (251)
Total energy cost			302.1697 (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] = 1.0832 (257)
SAP value	84.8889
SAP rating (Section 12)	85 (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	1771.5064	0.2160	382.6454 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1764.3371	0.2160	381.0968 (264)
Space and water heating			763.7422 (265)
Pumps and fans	113.8763	0.5190	59.1018 (267)
Energy for lighting	334.3600	0.5190	173.5329 (268)
Total kg/year			996.3769 (272)
CO2 emissions per m2			13.8100 (273)
EI value			88.6041
EI rating			89 (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	$3.48 / 0.8840 = 3.937$, stars = 4
Water heating environmental impact	$0.216 / 0.8840 = 0.2443$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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	72.1600 (1b)	x 2.4000 (2b)	= 173.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.1840 (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					4.1000
Infiltration rate					0.2050 (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) =				0.1743 (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	0.1830	0.1743	0.1743	0.1612	0.1612	0.1438	0.1481	0.1394	0.1438	0.1525	0.1525	0.1655 (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 2 (Uw = 1.30)			11.1900	1.2357	13.8279		(27)
Heat Loss Floor			72.1600	0.1000	7.2160		(28a)
WT-E-01	37.8000	11.1900	26.6100	0.2000	5.3220		(29a)
Common	10.8000		10.8000	0.2994	3.2332		(29a)
WT-I-11	21.7900		21.7900	0.2719	5.9248		(29a)
Total net area of external elements Aum(A, m2)			142.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5240		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Ceilings 1			72.1600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.8176 (36)
Total fabric heat loss							(33) + (36) = 48.3416 (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	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754	28.5754 (38)
Heat transfer coeff	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170	76.9170 (39)
Average = Sum(39)m / 12 =												76.9170 (39)
HLP	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659	1.0659 (40)
HLP (average)												1.0659 (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												2.2974 (42)
Average daily hot water use (litres/day)												88.7633 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
97.6396	94.0891	90.5386	86.9880	83.4375	79.8870	79.8870	83.4375	86.9880	86.9880	90.5386	94.0891	97.6396 (44)
Energy conte	144.7967	126.6401	130.6813	113.9311	109.3196	94.3345	87.4148	100.3098	101.5078	118.2975	129.1310	140.2279 (45)
Energy content (annual)												Total = Sum(45)m = 1396.5922 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7195	18.9960	19.6022	17.0897	16.3979	14.1502	13.1122	15.0465	15.2262	17.7446	19.3696	21.0342 (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	14.0959	12.7113	14.0405	13.5507	13.9755	13.4937	13.9242	13.9574	13.5247	14.0136	13.6044	(61)
Total heat required for water heating calculated for each month												
Solar input	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131 (62)
	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	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131 (64)
	Total per year (kWh/year) = Sum(64)m = 1561.5691 (64)											
Heat gains from water heating, kWh/month												
	51.6689	45.2857	46.9617	41.2698	39.8426	34.7396	32.5465	36.8424	37.1325	42.8373	46.3372	50.1471 (65)

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													1471.0116 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	315.8664	222.9745	150.4478	62.0958	14.3883	0.0000	0.0000	0.0000	0.0000	46.7353	178.9513	339.8062	(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)	349.0237	246.3806	166.2406	68.6141	15.8987	0.0000	0.0000	0.0000	0.0000	51.6412	197.7362	375.4764	(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													
Water heating requirement	158.8926	139.3514	144.7218	127.4818	123.2951	107.8282	101.3390	114.2672	115.0325	132.3111	142.7354	154.3131	(64)
Efficiency of water heater	89.4032	89.2419	88.9022	88.3229	87.6238	87.3000	87.3000	87.3000	87.3000	88.1132	89.0516	87.3000	(216)
Fuel for water heating, kWh/month	177.7258	156.1502	162.7876	144.3360	140.7096	123.5145	116.0813	130.8902	131.7669	150.1603	160.2838	172.4636	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1471.0116 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.8763 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.8763 (231)
Electricity for lighting (calculated in Appendix L)													334.3600 (232)
Total delivered energy for all uses													3686.1178 (238)

10a. Fuel costs - using BEDF prices (478)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1471.0116	3.8700	56.9281 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1766.8699	3.8700	68.3779 (247)
Mechanical ventilation fans	38.8763	18.9000	7.3476 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	334.3600	18.9000	63.1940 (250)
Additional standing charges			93.0000 (251)
Total energy cost			303.0227 (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	1471.0116	0.2160	317.7385 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1766.8699	0.2160	381.6439 (264)
Space and water heating			699.3824 (265)
Pumps and fans	113.8763	0.5190	59.1018 (267)
Energy for lighting	334.3600	0.5190	173.5329 (268)
Total kg/year			932.0171 (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	1471.0116	1.2200	1794.6341 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1766.8699	1.2200	2155.5812 (264)
Space and water heating			3950.2154 (265)
Pumps and fans	113.8763	3.0700	349.6004 (267)
Energy for lighting	334.3600	3.0700	1026.4853 (268)
Primary energy kWh/year			5326.3011 (272)
Primary energy kWh/m2/year			73.8124 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 89

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 85
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 478 TEST (27 May 2021)
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	£85	£85	£0
Mains gas	£218	£218	£0
Space heating	£171	£171	£0
Water heating	£68	£68	£0
Lighting	£63	£63	£0
Total cost of fuels	£303	£303	£0
Total cost of uses	£302	£302	£0
Delivered energy	51 kWh/m²	51 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	74 kWh/m²	74 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	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	171.45 (P1)
Transmission heat loss coefficient	48.34 (37)
Summer heat loss coefficient	219.79 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type	
Orientation				
South	0.000	1.000	None	
Solar shading				
Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	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
South	11.1900	112.2060	0.4500	0.0000
total:				508.5120

Solar gains	Jun	Jul	Aug	
Internal gains	527	509	502	(P4)
Total summer gains	401	384	392	
	928	893	894	(P5)
Summer gain/loss ratio	4.22	4.06	4.07	(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	20.47	22.21	22.12	(P7)
Likelihood of high internal temperature	Not significant	Medium	Medium	
Assessment of likelihood of high internal temperature:	Medium			