

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026c_070_As_Built				Issued on Date	11/01/2022
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	84 B	DER	17.94	TER	18.96	
Environmental	87 B	% DER<TER	5.37			
CO ₂ Emissions (t/year)	1.04	DFEE	44.30	TFEE	49.43	
General Requirements Compliance	Pass	% DFEE<TFEE	10.39			
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

Mid-floor flat, total floor area 71 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.96 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.94 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.33 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
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: 3.33 (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 West: 6.68 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 3.3 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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (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					3.3300
Infiltration rate					0.1665 (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) =				0.1290 (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	0.1645	0.1613	0.1581	0.1419	0.1387	0.1226	0.1226	0.1194	0.1290	0.1387	0.1452	0.1516 (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)			6.6800	1.2357	8.2548		(27)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss						(33) + (36) =	45.0501 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Heat transfer coeff	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (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												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (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	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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	153.2501	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	49.7941	(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	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	349.3220	347.0245	334.1205	313.6057	292.9740	273.2094	260.5136	266.4991	277.2046	297.9206	321.5424	339.0664	(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	
-----			6.6800		19.6403		0.4500		0.0000		0.7700		45.4597 (80)	
Solar gains			45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839 (83)
Total gains			394.7818	435.9534	480.5737	527.1990	554.7406	541.1742	515.6270	485.6377	447.5358	403.4423	378.2254	376.4503 (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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	
util living area	0.9986	0.9973	0.9929	0.9757	0.9180	0.7787	0.6057	0.6616	0.8920	0.9853	0.9972	0.9990	(86)
MIT	19.8807	19.9949	20.2106	20.4984	20.7686	20.9368	20.9871	20.9795	20.8572	20.5086	20.1347	19.8462	(87)
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	(88)
util rest of house	0.9982	0.9964	0.9903	0.9659	0.8839	0.6954	0.4855	0.5414	0.8345	0.9778	0.9961	0.9986	(89)
MIT 2	19.0314	19.1453	19.3598	19.6424	19.8940	20.0267	20.0542	20.0514	19.9733	19.6554	19.2851	18.9970	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	(91)
MIT	19.3354	19.4494	19.6643	19.9488	20.2070	20.3525	20.3881	20.3836	20.2897	19.9608	19.5892	19.3009	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1854	19.2994	19.5143	19.7988	20.0570	20.2025	20.2381	20.2336	20.1397	19.8108	19.4392	19.1509	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9976	0.9954	0.9883	0.9625	0.8839	0.7095	0.5094	0.5651	0.8404	0.9751	0.9951	0.9981	(94)
Ext temp.	393.8225	433.9344	474.9303	507.4189	490.3265	383.9538	262.6726	274.4496	376.1269	393.3964	376.3667	375.7430	(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	1088.8701	1053.3213	952.0023	797.2505	611.3192	409.8226	266.1283	280.4286	441.8074	673.7722	902.6153	1093.6648	(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	517.1154	416.2280	354.9416	208.6788	90.0185	0.0000	0.0000	0.0000	0.0000	208.5996	378.8990	534.1338	(98)
Space heating per m2												2708.6146	(98)
												(98) / (4) =	38.1710 (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													2992.9444 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	517.1154	416.2280	354.9416	208.6788	90.0185	0.0000	0.0000	0.0000	0.0000	208.5996	378.8990	534.1338	(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)	571.3983	459.9204	392.2007	230.5843	99.4680	0.0000	0.0000	0.0000	0.0000	230.4968	418.6729	590.2031	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Efficiency of water heater (217)m	89.7310	89.6798	89.5539	89.2644	88.6276	87.3000	87.3000	87.3000	87.3000	89.2358	89.6057	87.3000	(216)
Fuel for water heating, kWh/month	175.8534	154.3176	160.4974	141.8467	138.1815	122.6961	115.3229	130.0199	130.8860	147.2669	158.2005	170.7210	(219)
Water heating fuel used												1745.8101	(219)
Annual totals kWh/year													
Space heating fuel - main system												2992.9444	(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)													38.2298 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.2298 (231)
Electricity for lighting (calculated in Appendix L)													367.3218 (232)
Total delivered energy for all uses													5219.3060 (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	2992.9444	0.2160	646.4760	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1745.8101	0.2160	377.0950	(264)
Space and water heating			1023.5710	(265)
Pumps and fans	113.2298	0.5190	58.7663	(267)
Energy for lighting	367.3218	0.5190	190.6400	(268)
Total CO2, kg/year			1272.9772	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.9400	(273)

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

DER			17.9400	ZC1
Total Floor Area		TFA	70.9600	
Assumed number of occupants		N	2.2692	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6623	ZC2
CO2 emissions from cooking, equation (L16)			2.4445	ZC3
Total CO2 emissions			37.0468	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			37.0468	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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1762 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4262 (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) = 0.3303 (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	0.4211	0.4128	0.4046	0.3633	0.3550	0.3138	0.3138	0.3055	0.3303	0.3550	0.3716	0.3881 (22b)
Effective ac	0.5887	0.5852	0.5818	0.5660	0.5630	0.5492	0.5492	0.5467	0.5545	0.5630	0.5690	0.5753 (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)			6.6800	1.3258	8.8561		(27)
FT-03			70.9600	0.1300	9.2248		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876		(29a)
Total net area of external elements Aum(A, m ²)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 28.4233		(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)							12.6855 (36)
Total fabric heat loss							(33) + (36) = 41.1088 (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	33.0829	32.8894	32.6998	31.8090	31.6423	30.8664	30.8664	30.7228	31.1653	31.6423	31.9795	32.3320 (38)
Heat transfer coeff	74.1917	73.9982	73.8085	72.9177	72.7511	71.9752	71.9752	71.8315	72.2740	72.7511	73.0882	73.4407 (39)
Average = Sum(39)m / 12 =												72.9169 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0455	1.0428	1.0401	1.0276	1.0252	1.0143	1.0143	1.0123	1.0185	1.0252	1.0300	1.0350 (40)
HLP (average)												1.0276 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (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	49.3807	42.9800	45.7894	42.5745	42.1980	39.0991	40.4024	42.1980	42.5745	45.7894	46.0500	49.3807 (61)
Total heat required for water heating calculated for each month	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506 (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	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506 (64)
Heat gains from water heating, kWh/month	60.1268	52.5352	54.5710	48.2399	46.6240	40.9043	38.9467	43.6509	44.1403	50.4845	54.1246	58.6192 (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	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	80.8157	78.1773	73.3482	66.9999	62.6667	56.8116	52.3477	58.6705	61.3060	67.8555	75.1731	78.7892	(72)
Total internal gains	361.1802	358.2868	344.7902	323.6846	302.4585	282.1011	269.4117	275.9896	287.2924	308.5992	332.8098	350.9281	(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
West					6.6800	19.6403		0.6300	0.7000	0.7700		40.0955 (80)
Solar gains	40.0955	78.4353	129.1718	188.3893	230.8782	236.3449	225.0100	193.2802	150.2321	93.0701	49.9944	32.9726 (83)
Total gains	401.2757	436.7221	473.9620	512.0740	533.3367	518.4460	494.4217	469.2698	437.5245	401.6693	382.8042	383.9007 (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	66.4196	66.5932	66.7643	67.5800	67.7348	68.4649	68.4649	68.6019	68.1818	67.7348	67.4223	67.0987	
alpha	5.4280	5.4395	5.4510	5.5053	5.5157	5.5643	5.5643	5.5735	5.5455	5.5157	5.4948	5.4732	
util living area	0.9985	0.9973	0.9934	0.9784	0.9276	0.7934	0.6201	0.6714	0.8968	0.9855	0.9971	0.9988	(86)
MIT	19.8690	19.9797	20.1905	20.4838	20.7537	20.9331	20.9863	20.9791	20.8558	20.5114	20.1418	19.8505	(87)
Th 2	20.0456	20.0478	20.0500	20.0604	20.0624	20.0714	20.0714	20.0731	20.0679	20.0624	20.0584	20.0543	(88)
util rest of house	0.9980	0.9964	0.9909	0.9696	0.8964	0.7123	0.4997	0.5521	0.8411	0.9780	0.9959	0.9985	(89)
MIT 2	18.5285	18.6920	19.0008	19.4313	19.8039	20.0227	20.0659	20.0636	19.9422	19.4761	18.9370	18.5079	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	(91)
MIT	19.0083	19.1529	19.4266	19.8081	20.1439	20.3486	20.3953	20.3913	20.2692	19.8467	19.3682	18.9885	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0083	19.1529	19.4266	19.8081	20.1439	20.3486	20.3953	20.3913	20.2692	19.8467	19.3682	18.9885	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	400.1621	434.6007	468.6405	494.9490	479.7706	382.9250	268.5733	279.2535	374.1337	391.9159	380.7542	383.0625	(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	1091.2346	1054.6913	954.0965	795.3903	614.3019	413.7535	273.1697	286.7031	445.8747	672.7063	896.6637	1086.0745	(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	514.1580	416.7009	361.1793	216.3178	100.0913	0.0000	0.0000	0.0000	0.0000	208.9080	371.4549	523.0409	(98)
Space heating												2711.8511	(98)
Space heating per m ²												38.2166	(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													2903.4808 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	514.1580	416.7009	361.1793	216.3178	100.0913	0.0000	0.0000	0.0000	0.0000	208.9080	371.4549	523.0409	(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)	550.4903	446.1466	386.7016	231.6036	107.1641	0.0000	0.0000	0.0000	0.0000	223.6703	397.7033	560.0010	(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	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506	(64)
Efficiency of water heater	87.3988	87.2384	86.8289	85.8800	84.0478	80.3000	80.3000	80.3000	80.3000	85.6740	86.9101	87.4844	(217)
Fuel for water heating, kWh/month	220.9240	193.3377	202.1041	181.2366	179.2943	165.2825	158.3532	176.5268	178.4763	190.4830	200.4449	215.5249	(219)
Water heating fuel used												2261.9884	(219)
Annual totals kWh/year													
Space heating fuel - main system												2903.4808	(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)												367.3218	(232)
Total delivered energy for all uses												5607.7910	(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	2903.4808	0.2160	627.1519 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2261.9884	0.2160	488.5895 (264)
Space and water heating			1115.7414 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total CO2, kg/m2/year			1345.3063 (272)
Emissions per m2 for space and water heating			15.7235 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6866 (272b)
Emissions per m2 for pumps and fans			0.5485 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7235 * 1.00) + 2.6866 + 0.5485, rounded to 2 d.p.			18.9600 (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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (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) = 0.1762 (8)
Measured/design AP50					Yes
Infiltration rate					3.3300
Number of sides sheltered					0.3427 (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) =				0.2656 (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	0.3386	0.3319	0.3253	0.2921	0.2855	0.2523	0.2523	0.2456	0.2656	0.2855	0.2988	0.3120 (22b)
Effective ac	0.5573	0.5551	0.5529	0.5427	0.5407	0.5318	0.5318	0.5302	0.5353	0.5407	0.5446	0.5487 (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)			6.6800	1.2357	8.2548		(27)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum, m ²			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(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)							13.5974 (36)
Total fabric heat loss						(33) + (36) =	45.0501 (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	31.3216	31.1965	31.0739	30.4980	30.3902	29.8886	29.8886	29.7957	30.0818	30.3902	30.6082	30.8361 (38)
Heat transfer coeff	76.3717	76.2466	76.1240	75.5481	75.4403	74.9387	74.9387	74.8458	75.1319	75.4403	75.6583	75.8862 (39)
Average = Sum(39)m / 12 =												75.5476 (39)
HLP	1.0763	1.0745	1.0728	1.0647	1.0631	1.0561	1.0561	1.0548	1.0588	1.0631	1.0662	1.0694 (40)
HLP (average)												1.0646 (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												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy content (annual)	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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	30.5372	26.7080	27.5603	24.0277	23.0552	19.8948	18.4355	21.1550	21.4077	24.9486	27.2333	29.5736 (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	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	41.0446	39.7440	37.0434	33.3718	30.9881	27.6317	24.7789	28.4341	29.7329	33.5330	37.8240	39.7495	(72)
Total internal gains	318.4091	316.8535	305.4854	287.0566	267.7799	249.9213	238.8429	242.7532	252.7193	271.2767	292.4608	308.8884	(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
West	6.6800				19.6403		0.4500		0.0000		0.7700		45.4597 (80)
Solar gains	45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839	(83)
Total gains	363.8688	405.7824	451.9387	500.6499	529.5465	517.8860	493.9562	461.8918	423.0505	376.7984	349.1437	346.2723	(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	64.5236	64.6295	64.7336	65.2271	65.3202	65.7574	65.7574	65.8391	65.5883	65.3202	65.1320	64.9364	
alpha	5.3016	5.3086	5.3156	5.3485	5.3547	5.3838	5.3838	5.3893	5.3726	5.3547	5.3421	5.3291	
util living area	0.9991	0.9981	0.9949	0.9815	0.9347	0.8093	0.6403	0.6994	0.9150	0.9897	0.9982	0.9993	(86)
MIT	19.7767	19.8962	20.1218	20.4317	20.7221	20.9185	20.9819	20.9714	20.8233	20.4464	20.0550	19.7523	(87)
Th 2	20.0203	20.0217	20.0231	20.0298	20.0311	20.0369	20.0369	20.0379	20.0346	20.0311	20.0285	20.0259	(88)
util rest of house	0.9988	0.9975	0.9929	0.9738	0.9052	0.7279	0.5138	0.5750	0.8644	0.9841	0.9974	0.9991	(89)
MIT 2	18.8972	19.0176	19.2436	19.5548	19.8304	19.9958	20.0318	20.0289	19.9267	19.5729	19.1819	18.8774	(90)
Living area fraction	19.2120	19.3321	19.5580	19.8687	20.1496	20.3261	20.3719	20.3663	20.2476	19.8856	19.4944	19.1906	(91)
MIT	19.2120	19.3321	19.5580	19.8687	20.1496	20.3261	20.3719	20.3663	20.2476	19.8856	19.4944	19.1906	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2120	19.3321	19.5580	19.8687	20.1496	20.3261	20.3719	20.3663	20.2476	19.8856	19.4944	19.1906	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9968	0.9917	0.9721	0.9094	0.7547	0.5598	0.6202	0.8776	0.9830	0.9968	0.9988	(94)
Ext temp.	363.2840	404.4962	448.1791	486.6971	481.5772	390.8681	276.4972	286.4488	371.2761	370.3812	348.0233	345.8465	(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	1138.8551	1100.3983	994.0242	828.6617	637.4423	429.1073	282.6600	296.8590	461.8816	700.5061	937.7396	1137.5783	(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	577.0249	467.6462	406.1087	246.2146	115.9636	0.0000	0.0000	0.0000	0.0000	245.6129	424.5957	589.0485	(98)
Space heating per m ²												3072.2151	(98)
												43.2950	(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	704.4239	554.5465	568.8282	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8351	0.9074	0.8808	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.2760	503.1743	501.0018	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	690.9813	661.4127	625.7432	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	73.9478	117.7294	92.8076	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												284.4848	(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	0.0000	18.4869	29.4324	23.2019	0.0000	0.0000	0.0000 (107)
Space cooling											71.1212 (107)
Space cooling per m2											1.0023 (108)
Energy for space heating											43.2950 (99)
Energy for space cooling											1.0023 (108)
Total											44.2973 (109)
Dwelling Fabric Energy Efficiency (DFEE)											44.3 (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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1762 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4262 (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) =	0.3303 (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												
	0.4211	0.4128	0.4046	0.3633	0.3550	0.3138	0.3138	0.3055	0.3303	0.3550	0.3716	0.3881 (22b)
Effective ac	0.5887	0.5852	0.5818	0.5660	0.5630	0.5492	0.5492	0.5467	0.5545	0.5630	0.5690	0.5753 (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)			6.6800	1.3258	8.8561		(27)
FT-03			70.9600	0.1300	9.2248		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876		(29a)
Total net area of external elements Aum(A, m ²)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4233		(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)							12.6855 (36)
Total fabric heat loss						(33) + (36) =	41.1088 (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	33.0829	32.8894	32.6998	31.8090	31.6423	30.8664	30.8664	30.7228	31.1653	31.6423	31.9795	32.3320 (38)
Heat transfer coeff	74.1917	73.9982	73.8085	72.9177	72.7511	71.9752	71.9752	71.8315	72.2740	72.7511	73.0882	73.4407 (39)
Average = Sum(39)m / 12 =												72.9169 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0455	1.0428	1.0401	1.0276	1.0252	1.0143	1.0143	1.0123	1.0185	1.0252	1.0300	1.0350 (40)
HLP (average)												1.0276 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (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	(59)
Heat gains from water heating, kWh/month	30.5372	26.7080	27.5603	24.0277	23.0552	19.8948	18.4355	21.1550	21.4077	24.9486	27.2333	29.5736 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	41.0446	39.7440	37.0434	33.3718	30.9881	27.6317	24.7789	28.4341	29.7329	33.5330	37.8240	39.7495 (72)
Total internal gains	318.4091	316.8535	305.4854	287.0566	267.7799	249.9213	238.8429	242.7532	252.7193	271.2767	292.4608	308.8884 (73)

6. Solar gains

[Jan]												
Area	6.6800											
Solar flux	19.6403											
Specific data	0.6300											
FF	0.7000											
Access factor	0.7700											
Gains	40.0955											(80)
Solar gains	40.0955	78.4353	129.1718	188.3893	230.8782	236.3449	225.0100	193.2802	150.2321	93.0701	49.9944	32.9726 (83)
Total gains	358.5046	395.2888	434.6572	475.4459	498.6581	486.2662	463.8528	436.0334	402.9514	364.3468	342.4551	341.8610 (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	66.4196	66.5932	66.7643	67.5800	67.7348	68.4649	68.4649	68.6019	68.1818	67.7348	67.4223	67.0987
Feb	5.4280	5.4395	5.4510	5.5053	5.5157	5.5643	5.5643	5.5735	5.5455	5.5157	5.4948	5.4732
util living area	0.9992	0.9983	0.9956	0.9844	0.9434	0.8238	0.6545	0.7111	0.9217	0.9907	0.9983	0.9994 (86)
MIT	19.8116	19.9245	20.1391	20.4392	20.7208	20.9185	20.9822	20.9724	20.8274	20.4642	20.0880	19.7939 (87)
Th 2	20.0456	20.0478	20.0500	20.0604	20.0624	20.0714	20.0714	20.0731	20.0679	20.0624	20.0584	20.0543 (88)
util rest of house	0.9989	0.9978	0.9940	0.9778	0.9171	0.7463	0.5306	0.5900	0.8745	0.9857	0.9976	0.9991 (89)
MIT 2	18.9526	19.0671	19.2828	19.5881	19.8578	20.0295	20.0663	20.0642	19.9609	19.6164	19.2392	18.9420 (90)
Living area fraction	19.2601	19.3740	19.5893	19.8927	20.1667	20.3477	20.3942	20.3893	20.2711	19.9199	19.5430	19.2470 (92)
MIT	19.2601	19.3740	19.5893	19.8927	20.1667	20.3477	20.3942	20.3893	20.2711	19.9199	19.5430	19.2470 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2601	19.3740	19.5893	19.8927	20.1667	20.3477	20.3942	20.3893	20.2711	19.9199	19.5430	19.2470 (93)

8. Space heating requirement

Utilisation	0.9985	0.9972	0.9929	0.9763	0.9206	0.7718	0.5756	0.6340	0.8868	0.9847	0.9971	0.9989 (94)
Useful gains	357.9781	394.1851	431.5648	464.1610	459.0432	375.2798	267.0085	276.4494	357.3172	358.7666	341.4564	341.4768 (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	1109.9142	1071.0518	966.1025	801.5650	615.9612	413.6930	273.0871	286.5552	446.0075	678.0316	909.4359	1105.0605 (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	559.4404	454.8544	397.6961	242.9309	116.7470	0.0000	0.0000	0.0000	0.0000	237.5332	408.9452	568.1063 (98)
Space heating												2986.2534 (98)
Space heating per m2												(98) / (4) = 42.0836 (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	676.5669	532.6165	545.9196	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8329	0.9072	0.8822	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.5370	483.2068	481.6023	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	654.0230	626.2270	595.5191	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.1499	106.4070	84.7542	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												256.3111 (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	16.2875	26.6018	21.1885	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												64.0778 (107)
Space cooling per m2												0.9030 (108)
Energy for space heating												42.0836 (99)
Energy for space cooling												0.9030 (108)
Total												42.9866 (109)
Target Fabric Energy Efficiency (TFEE)												49.4 (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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (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					3.3300
Infiltration rate					0.1665 (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) =				0.1290 (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	0.1355	0.1290	0.1290	0.1194	0.1194	0.1065	0.1097	0.1032	0.1065	0.1129	0.1129	0.1226 (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)			6.6800	1.2357	8.2548		(27)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss							(33) + (36) = 45.0501 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Heat transfer coeff	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (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												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (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	(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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
RHI water heating demand	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)
Heat gains from water heating, kWh/month													
	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(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
West					6.6800	22.3313	0.4500	0.0000			0.7700	51.6885 (80)
Solar gains	51.6885	90.9534	147.6923	221.3484	263.7460	288.7182	271.9842	239.2816	185.9848	115.1712	66.0257	42.0937 (83)
Total gains	569.7145	604.2133	640.3036	682.4992	693.0515	689.7821	656.8833	632.6347	597.7880	558.6361	544.3260	546.3950 (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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651		
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910		
util living area	0.9898	0.9846	0.9664	0.9091	0.7665	0.5225	0.3446	0.3690	0.6746	0.9190	0.9795	0.9916	(86)	
MIT	20.1894	20.2808	20.4912	20.7410	20.9270	20.9927	20.9994	20.9991	20.9716	20.7643	20.4348	20.1595	(87)	
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	(88)	
util rest of house	0.9865	0.9796	0.9552	0.8795	0.7007	0.4279	0.2402	0.2609	0.5801	0.8857	0.9717	0.9888	(89)	
MIT 2	19.3378	19.4277	19.6325	19.8645	20.0162	20.0555	20.0576	20.0576	20.0461	19.8900	19.5800	19.3084	(90)	
Living area fraction	19.6426	19.7331	19.9399	20.1782	20.3422	20.3910	20.3947	20.3946	20.3774	20.2030	19.8860	19.6130	(92)	
Temperature adjustment	19.4926	19.5831	19.7899	20.0282	20.1922	20.2410	20.2447	20.2446	20.2274	20.0530	19.7360	19.4630	(93)	
adjusted MIT														

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	560.5723	590.0125	609.1478	599.5303	492.6073	308.0933	171.4386	178.6999	357.4916	494.6474	527.1109	539.0536	(94)
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	1052.8225	1022.8647	906.3230	740.8838	526.1115	310.2269	171.5182	178.8244	367.7530	618.3380	858.4895	1050.6589	(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	366.2341	290.8767	221.0984	101.7745	24.9272	0.0000	0.0000	0.0000	0.0000	92.0257	238.5926	380.6344	(98)
Space heating													
RHI space heating demand													

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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (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					3.3300
Infiltration rate					0.1665 (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) =				0.1290 (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	0.1645	0.1613	0.1581	0.1419	0.1387	0.1226	0.1226	0.1194	0.1290	0.1387	0.1452	0.1516 (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)			6.6800	1.2357	8.2548		(27)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss							(33) + (36) = 45.0501 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Heat transfer coeff	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (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												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(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
West			6.6800	19.6403		0.4500		0.0000		0.7700		45.4597 (80)
Solar gains	45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839 (83)
Total gains	563.4857	602.1888	639.0645	674.7442	691.0722	669.0286	640.0124	612.4917	582.1344	548.9865	534.9833	541.6852 (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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651		
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910		
util living area	0.9923	0.9876	0.9744	0.9353	0.8392	0.6669	0.4971	0.5400	0.7798	0.9472	0.9858	0.9937	(86)	
MIT	20.1037	20.2112	20.4075	20.6564	20.8643	20.9703	20.9950	20.9922	20.9313	20.6743	20.3379	20.0657	(87)	
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	(88)	
util rest of house	0.9899	0.9837	0.9662	0.9141	0.7898	0.5821	0.3937	0.4342	0.7033	0.9254	0.9807	0.9918	(89)	
MIT 2	19.2529	19.3590	19.5513	19.7879	19.9690	20.0444	20.0564	20.0555	20.0220	19.8090	19.4852	19.2152	(90)	
Living area fraction										fLA = Living area / (4) =		0.3579	(91)	
MIT	19.5574	19.6641	19.8578	20.0988	20.2894	20.3758	20.3924	20.3908	20.3475	20.1187	19.7904	19.5196	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.4074	19.5141	19.7078	19.9488	20.1394	20.2258	20.2424	20.2408	20.1975	19.9687	19.6404	19.3696	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9809	0.9624	0.9112	0.7945	0.5980	0.4143	0.4552	0.7157	0.9229	0.9778	0.9899	(94)
Useful gains	556.5603	590.6584	615.0610	614.8157	549.0702	400.0548	265.1718	278.8356	416.6556	506.6454	523.0801	536.2289	(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	1105.1129	1069.0245	966.1547	808.2199	617.3472	411.5322	266.4408	280.9556	446.0333	685.3265	917.3339	1109.6619	(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	408.1232	321.4620	261.2137	139.2510	50.7981	0.0000	0.0000	0.0000	0.0000	132.9387	283.8628	426.6342	(98)
Space heating												2024.2836	(98)
Space heating per m2												(98) / (4) =	28.5271 (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													2236.7774 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	408.1232	321.4620	261.2137	139.2510	50.7981	0.0000	0.0000	0.0000	0.0000	132.9387	283.8628	426.6342	(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)	450.9648	355.2066	288.6339	153.8685	56.1305	0.0000	0.0000	0.0000	0.0000	146.8936	313.6605	471.4190	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Efficiency of water heater (217)m	89.5844	89.5126	89.3377	88.9473	88.2145	87.3000	87.3000	87.3000	87.3000	88.8804	89.4085	87.3000	(216)
Fuel for water heating, kWh/month	176.1412	154.6058	160.8857	142.3525	138.8287	122.6961	115.3229	130.0199	130.8860	147.8557	158.5496	170.9776	(219)
Water heating fuel used												1749.1217	(219)
Annual totals kWh/year													
Space heating fuel - main system												2236.7774	(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)													38.2298 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.2298 (231)
Electricity for lighting (calculated in Appendix L)													367.3218 (232)
Total delivered energy for all uses													4466.4507 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2236.7774	3.4800	77.8399 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1749.1217	3.4800	60.8694 (247)
Mechanical ventilation fans	38.2298	13.1900	5.0425 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	367.3218	13.1900	48.4497 (250)
Additional standing charges			120.0000 (251)
Total energy cost			322.0940 (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] =	1.1666 (257)
SAP value		83.7259
SAP rating (Section 12)		84 (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	2236.7774	0.2160	483.1439 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1749.1217	0.2160	377.8103 (264)
Space and water heating			860.9542 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1110.3605 (272)
CO2 emissions per m2			15.6500 (273)
EI value			87.1690
EI rating			87 (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	$3.48 / 0.8856 = 3.930$, stars = 4
Water heating environmental impact	$0.216 / 0.8856 = 0.2439$, 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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (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					3.3300
Infiltration rate					0.1665 (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) =				0.1290 (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	0.1355	0.1290	0.1290	0.1194	0.1194	0.1065	0.1097	0.1032	0.1065	0.1129	0.1129	0.1226 (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)			6.6800	1.2357	8.2548		(27)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss							(33) + (36) = 45.0501 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Heat transfer coeff	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (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												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (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	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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	153.2501	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	49.7941	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(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	

West				6.6800	22.3313	0.4500		0.0000	0.7700		51.6885 (80)	

Solar gains	51.6885	90.9534	147.6923	221.3484	263.7460	288.7182	271.9842	239.2816	185.9848	115.1712	66.0257	42.0937 (83)
Total gains	569.7145	604.2133	640.3036	682.4992	693.0515	689.7821	656.8833	632.6347	597.7880	558.6361	544.3260	546.3950 (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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	
util living area	0.9898	0.9846	0.9664	0.9091	0.7665	0.5225	0.3446	0.3690	0.6746	0.9190	0.9795	0.9916	(86)
MIT	20.1894	20.2808	20.4912	20.7410	20.9270	20.9927	20.9994	20.9991	20.9716	20.7643	20.4348	20.1595	(87)
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	(88)
util rest of house	0.9865	0.9796	0.9552	0.8795	0.7007	0.4279	0.2402	0.2609	0.5801	0.8857	0.9717	0.9888	(89)
MIT 2	19.3378	19.4277	19.6325	19.8645	20.0162	20.0555	20.0576	20.0576	20.0461	19.8900	19.5800	19.3084	(90)
Living area fraction	19.6426	19.7331	19.9399	20.1782	20.3422	20.3910	20.3947	20.3946	20.3774	20.2030	19.8860	19.6130	(91)
MIT	19.4926	19.5831	19.7899	20.0282	20.1922	20.2410	20.2447	20.2446	20.2274	20.0530	19.7360	19.4630	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4926	19.5831	19.7899	20.0282	20.1922	20.2410	20.2447	20.2446	20.2274	20.0530	19.7360	19.4630	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9840	0.9765	0.9513	0.8784	0.7108	0.4467	0.2610	0.2825	0.5980	0.8855	0.9684	0.9866	(94)
Ext temp.	5.1000	5.6000	6.0914	5.9933	492.6073	308.0933	171.4386	178.6999	357.4916	494.6474	527.1109	539.0536	(95)
Heat loss rate W	1052.8225	1022.8647	906.3230	740.8838	526.1115	310.2269	171.5182	178.8244	367.7530	618.3380	858.4895	1050.6589	(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	366.2341	290.8767	221.0984	101.7745	24.9272	0.0000	0.0000	0.0000	0.0000	92.0257	238.5926	380.6344	(98)
Space heating												1716.1635	(98)
Space heating per m2												24.1849	(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													1896.3133 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	366.2341	290.8767	221.0984	101.7745	24.9272	0.0000	0.0000	0.0000	0.0000	92.0257	238.5926	380.6344	(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)	404.6786	321.4107	244.3076	112.4580	27.5438	0.0000	0.0000	0.0000	0.0000	101.6859	263.6382	420.5905	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Efficiency of water heater	89.5120	89.4430	89.2117	88.6976	87.8252	87.3000	87.3000	87.3000	87.3000	88.5901	89.2803	87.3000	(216)
(217)m	89.5120	89.4430	89.2117	88.6976	87.8252	87.3000	87.3000	87.3000	87.3000	88.5901	89.2803	89.5577	(217)
Fuel for water heating, kWh/month	176.2837	154.7260	161.1129	142.7532	139.4441	122.6961	115.3229	130.0199	130.8860	148.3402	158.7772	171.1189	(219)
Water heating fuel used												1751.4811	(219)
Annual totals kWh/year													
Space heating fuel - main system												1896.3133	(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)												38.2298	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												113.2298	(231)
Electricity for lighting (calculated in Appendix L)												367.3218	(232)
Total delivered energy for all uses												4128.3460	(238)

10a. Fuel costs - using BEDF prices (486)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1896.3133	3.7400	70.9221 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1751.4811	3.7400	65.5054 (247)
Mechanical ventilation fans	38.2298	19.1200	7.3095 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	367.3218	19.1200	70.2319 (250)
Additional standing charges			94.0000 (251)
Total energy cost			322.3090 (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	1896.3133	0.2160	409.6037 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1751.4811	0.2160	378.3199 (264)
Space and water heating			787.9236 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1037.3299 (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	1896.3133	1.2200	2313.5022 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1751.4811	1.2200	2136.8070 (264)
Space and water heating			4450.3092 (265)
Pumps and fans	113.2298	3.0700	347.6156 (267)
Energy for lighting	367.3218	3.0700	1127.6778 (268)
Primary energy kWh/year			5925.6026 (272)
Primary energy kWh/m2/year			83.5062 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 87

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 84
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 486 TEST (30 Nov 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	£92	£92	£0
Mains gas	£230	£230	£0
Space heating	£187	£187	£0
Water heating	£66	£66	£0
Lighting	£70	£70	£0
Total cost of fuels	£322	£322	£0
Total cost of uses	£323	£323	£0
Delivered energy	58 kWh/m²	58 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	84 kWh/m²	84 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	East
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	337.20 (P1)
Transmission heat loss coefficient	45.05 (37)
Summer heat loss coefficient	382.25 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
West	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
West	6.6800	117.5071	0.4500 0.0000
total:			0.9000 317.9036

Solar gains	Jun	Jul	Aug	(P4)
Internal gains	337	318	280	
Total summer gains	398	382	390	(P5)
Summer gain/loss ratio	1.92	1.83	1.75	(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	18.17	19.98	19.80	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			