

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW012c_208_As_Built				Issued on Date	15/07/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	82 B	DER	20.56	TER	22.04	
Environmental	87 B	% DER<TER	6.73			
CO ₂ Emissions (t/year)	0.88	DFEE	51.07	TFEE	58.24	
General Requirements Compliance	Pass	% DFEE<TFEE	12.32			
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 51 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) 22.04 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.56 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)58.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.12 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: 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): Slight OK

Based on:

Overshading: Average
Windows facing South: 6.42 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 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	51.0900 (1b)	x 2.3700 (2b)	= 121.0833 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.0833 (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					4.1200
Infiltration rate					0.2060 (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) =				0.1597 (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	0.2036	0.1996	0.1956	0.1756	0.1716	0.1517	0.1517	0.1477	0.1597	0.1716	0.1796	0.1876 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.0600	1.0000	2.0600		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
Heat Loss Floor 1			51.0900	0.1194	6.1023		(28b)
WT-E-01 100	25.6000	6.4200	19.1800	0.2000	3.8360		(29a)
WT-I-01 Common	29.2900	2.0600	27.2300	0.2544	6.9282		(29a)
Flat	8.7000		8.7000	0.1500	1.3050		(30)
Total net area of external elements Aum(A, m ²)			114.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1649		(33)
Party Wall 1			9.0100	0.0000	0.0000		(32)
Party Ceilings 1			42.3900				(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)							16.9156 (36)
Total fabric heat loss							(33) + (36) = 45.0805 (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	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787 (38)
Heat transfer coeff	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593 (39)
Average = Sum(39)m / 12 =												65.0593 (39)
HLP	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734 (40)
HLP (average)												1.2734 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7222 (42)
Average daily hot water use (litres/day)												75.1029 (43)
Daily hot water use	82.6131	79.6090	76.6049	73.6008	70.5967	67.5926	67.5926	70.5967	73.6008	76.6049	79.6090	82.6131 (44)
Energy conte	122.5129	107.1506	110.5698	96.3974	92.4956	79.8167	73.9619	84.8723	85.8860	100.0918	109.2581	118.6472 (45)
Energy content (annual)												Total = Sum(45)m = 1181.6603 (45)
Distribution loss (46)m = 0.15 x (45)m												

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r16

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	18.3769	16.0726	16.5855	14.4596	13.8743	11.9725	11.0943	12.7309	12.8829	15.0138	16.3887	17.7971 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	13.9995	12.6300	13.9598	13.4831	13.9133	13.4423	13.8765	13.9004	13.4645	13.9406	13.5216	13.9918 (61)
Total heat required for water heating calculated for each month	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (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	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (64)
Heat gains from water heating, kWh/month	44.2354	38.7851	40.2544	35.4229	34.2331	29.8996	28.0615	31.6951	31.9232	36.7657	39.7087	42.9481 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6985	13.0551	10.6171	8.0378	6.0084	5.0725	5.4810	7.1245	9.5624	12.1417	14.1712	15.1070 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.0645	151.6217	147.6976	139.3436	128.7983	118.8872	112.2659	110.7087	114.6328	122.9867	133.5321	143.4432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111 (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)	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890 (71)
Water heating gains (Table 5)	59.4562	57.7159	54.1054	49.1985	46.0122	41.5272	37.7170	42.6010	44.3378	49.4162	55.1510	57.7260 (72)
Total internal gains	276.0525	274.2260	264.2534	248.4133	232.6523	217.3203	207.2974	212.2676	220.3664	236.3781	254.6876	268.1096 (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				6.4200	46.7521	0.4500	0.0000			0.7700			104.0014 (78)
Solar gains	104.0014	170.3274	216.9670	245.2198	255.5342	245.9169	240.2757	233.3410	226.6476	183.7141	123.2771	89.8668 (83)	
Total gains	380.0539	444.5534	481.2204	493.6331	488.1865	463.2372	447.5731	445.6086	447.0140	420.0922	377.9647	357.9764 (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	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336
alpha	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356
util living area	0.9950	0.9891	0.9779	0.9538	0.8982	0.7761	0.6080	0.6326	0.8243	0.9553	0.9897	0.9962 (86)
MIT	19.7265	19.9074	20.1500	20.4312	20.7006	20.8978	20.9746	20.9688	20.8554	20.5051	20.0467	19.6761 (87)
Th 2	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617 (88)
util rest of house	0.9933	0.9855	0.9701	0.9360	0.8553	0.6810	0.4662	0.4946	0.7435	0.9345	0.9856	0.9949 (89)
MIT 2	18.7202	18.8993	19.1382	19.4103	19.6577	19.8134	19.8553	19.8531	19.7853	19.4842	19.0388	18.6701 (90)
Living area fraction									fLA = Living area / (4) =			0.5246 (91)
MIT	19.2481	19.4281	19.6689	19.9458	20.2048	20.3822	20.4424	20.4383	20.3466	20.0197	19.5675	19.1978 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0981	19.2781	19.5189	19.7958	20.0548	20.2322	20.2924	20.2883	20.1966	19.8697	19.4175	19.0478 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9918	0.9831	0.9672	0.9348	0.8637	0.7150	0.5224	0.5491	0.7701	0.9347	0.9835	0.9937 (94)
Ext temp.	376.9433	437.0233	465.4520	461.4414	421.6437	331.1972	233.8162	244.7054	344.2586	392.6697	371.7454	355.7068 (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	962.7539	935.4290	847.0036	708.8735	543.5548	366.4278	240.2276	252.9715	396.6412	603.0822	801.3684	965.9892 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	435.8431	334.9287	283.8744	178.1512	90.7019	0.0000	0.0000	0.0000	0.0000	156.5469	309.3286	454.0501 (98)
Space heating per m ²												2243.4248 (98)
										(98) / (4) =		43.9112 (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													2478.9224	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	435.8431	334.9287	283.8744	178.1512	90.7019	0.0000	0.0000	0.0000	0.0000	156.5469	309.3286	454.0501	(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)	481.5945	370.0869	313.6734	196.8521	100.2231	0.0000	0.0000	0.0000	0.0000	172.9800	341.7996	501.7128	(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	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390	(64)	
Efficiency of water heater (217)m	89.7156	89.6345	89.4997	89.2519	88.7439	87.3000	87.3000	87.3000	87.3000	89.1232	89.5671	89.7562	(216)	
Fuel for water heating, kWh/month	152.1611	133.6322	139.1397	123.1127	119.9055	106.8258	100.6168	113.1417	113.8036	127.9492	137.0811	147.7770	(219)	
Water heating fuel used												1515.1465	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2478.9224	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)														
mechanical ventilation fans (SFP = 0.1840)													27.1808	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													102.1808	(231)
Electricity for lighting (calculated in Appendix L)													259.5801	(232)
Total delivered energy for all uses													4355.8298	(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	2478.9224	0.2160	535.4472	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1515.1465	0.2160	327.2716	(264)
Space and water heating			862.7189	(265)
Pumps and fans	102.1808	0.5190	53.0318	(267)
Energy for lighting	259.5801	0.5190	134.7221	(268)
Total CO2, kg/year			1050.4728	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.5600	(273)

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

DER		20.5600	ZC1
Total Floor Area		51.0900	
Assumed number of occupants		1.7222	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		17.4056	ZC2
CO2 emissions from cooking, equation (L16)		3.1383	ZC3
Total CO2 emissions		41.1038	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		41.1038	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	51.0900 (1b)	x 2.3700 (2b)	= 121.0833 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.0833 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1652 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4152 (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) =				0.3218 (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	0.4102	0.4022	0.3942	0.3539	0.3459	0.3057	0.3057	0.2976	0.3218	0.3459	0.3620	0.3781 (22b)
	0.5842	0.5809	0.5777	0.5626	0.5598	0.5467	0.5467	0.5443	0.5518	0.5598	0.5655	0.5715 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.0600	1.0000	2.0600			(26)					
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114			(27)					
Heat Loss Floor 1			51.0900	0.1300	6.6417			(28b)					
WT-E-01 100	25.6000	6.4200	19.1800	0.1800	3.4524			(29a)					
WT-I-01 Common	29.2900	2.0600	27.2300	0.1800	4.9014			(29a)					
Flat	8.7000		8.7000	0.1300	1.1310			(30)					
Total net area of external elements Aum(A, m2)			114.6800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	26.6979			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.1275 (36)					
Total fabric heat loss						(33) + (36) =		42.8254 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 23.3412	Feb 23.2106	Mar 23.0826	Apr 22.4815	May 22.3690	Jun 21.8455	Jul 21.8455	Aug 21.7485	Sep 22.0471	Oct 22.3690	Nov 22.5966	Dec 22.8344	(38)
Heat transfer coeff	66.1666	66.0360	65.9080	65.3069	65.1944	64.6708	64.6708	64.5739	64.8725	65.1944	65.4219	65.6598	(39)
Average = Sum(39)m / 12 =												65.3063	(39)
HLP	Jan 1.2951	Feb 1.2925	Mar 1.2900	Apr 1.2783	May 1.2761	Jun 1.2658	Jul 1.2658	Aug 1.2639	Sep 1.2698	Oct 1.2761	Nov 1.2805	Dec 1.2852	(40)
HLP (average)												1.2783	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7222 (42)
Average daily hot water use (litres/day)												75.1029 (43)
Daily hot water use	82.6131	79.6090	76.6049	73.6008	70.5967	67.5926	67.5926	70.5967	73.6008	76.6049	79.6090	82.6131 (44)
Energy conte	122.5129	107.1506	110.5698	96.3974	92.4956	79.8167	73.9619	84.8723	85.8860	100.0918	109.2581	118.6472 (45)
Energy content (annual)										Total = Sum(45)m =		1181.6603 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3769	16.0726	16.5855	14.4596	13.8743	11.9725	11.0943	12.7309	12.8829	15.0138	16.3887	17.7971 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	42.0987	36.6420	39.0370	36.2963	35.9753	33.3333	34.4444	35.9753	36.2963	39.0370	39.2592	42.0987 (61)
Solar input	164.6116	143.7925	149.6068	132.6937	128.4709	113.1500	108.4063	120.8476	122.1823	139.1289	148.5173	160.7459 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	164.6116	143.7925	149.6068	132.6937	128.4709	113.1500	108.4063	120.8476	122.1823	139.1289	148.5173	160.7459 (64)
	51.2602	44.7881	46.5237	41.1262	39.7486	34.8724	33.2034	37.2139	37.6312	43.0398	46.1431	49.9749 (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	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6985	13.0551	10.6171	8.0378	6.0084	5.0725	5.4810	7.1245	9.5624	12.1417	14.1712	15.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.0645	151.6217	147.6976	139.3436	128.7983	118.8872	112.2659	110.7087	114.6328	122.9867	133.5321	143.4432	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	(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)	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	(71)
Water heating gains (Table 5)	68.8982	66.6489	62.5319	57.1197	53.4256	48.4339	44.6283	50.0187	52.2655	57.8492	64.0877	67.1705	(72)
Total internal gains	285.4945	283.1590	272.6799	256.3346	240.0656	224.2269	214.2086	219.6852	228.2941	244.8110	263.6243	277.5541	(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					6.4200	46.7521	0.6300	0.7000			0.7700	91.7292 (78)	
Solar gains	91.7292	150.2288	191.3649	216.2838	225.3811	216.8987	211.9232	205.8068	199.9032	162.0359	108.7304	79.2625	(83)
Total gains	377.2237	433.3878	464.0448	472.6184	465.4467	441.1256	426.1318	425.4920	428.1973	406.8469	372.3547	356.8166	(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	53.6210	53.7270	53.8313	54.3268	54.4206	54.8611	54.8611	54.9435	54.6906	54.4206	54.2313	54.0348	
alpha	4.5747	4.5818	4.5888	4.6218	4.6280	4.6574	4.6574	4.6629	4.6460	4.6280	4.6154	4.6023	
util living area	0.9952	0.9902	0.9810	0.9604	0.9117	0.7960	0.6301	0.6527	0.8406	0.9601	0.9904	0.9962	(86)
MIT	19.6934	19.8640	20.1029	20.3959	20.6730	20.8870	20.9711	20.9652	20.8423	20.4836	20.0293	19.6587	(87)
Th 2	19.8447	19.8467	19.8486	19.8579	19.8596	19.8677	19.8677	19.8692	19.8646	19.8596	19.8561	19.8525	(88)
util rest of house	0.9935	0.9870	0.9742	0.9447	0.8725	0.7036	0.4862	0.5136	0.7630	0.9411	0.9865	0.9950	(89)
MIT 2	18.1298	18.3790	18.7257	19.1498	19.5284	19.7878	19.8568	19.8548	19.7401	19.2785	18.6274	18.0848	(90)
Living area fraction													(91)
MIT	18.9500	19.1580	19.4481	19.8035	20.1288	20.3644	20.4413	20.4373	20.3183	19.9106	19.3628	18.9104	(92)
Temperature adjustment													(93)
adjusted MIT	18.9500	19.1580	19.4481	19.8035	20.1288	20.3644	20.4413	20.4373	20.3183	19.9106	19.3628	18.9104	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9918	0.9844	0.9712	0.9438	0.8832	0.7477	0.5623	0.5869	0.7975	0.9422	0.9843	0.9935	(94)
Ext temp.	374.1355	426.6131	450.6698	446.0638	411.0632	329.8512	239.6133	249.7340	341.4795	383.3112	366.5027	354.5077	(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	969.3414	941.5388	853.3866	712.0728	549.5117	372.7900	248.4214	260.7027	403.3958	607.0015	802.2571	965.8832	(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	442.8332	346.0301	299.6213	191.5265	103.0057	0.0000	0.0000	0.0000	0.0000	166.4256	313.7432	454.8634	(98)
Space heating per m2													(98) / (4) =
													45.3719 (99)

8c. Space cooling requirement

Not applicable

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

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Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2481.8511 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	442.8332	346.0301	299.6213	191.5265	103.0057	0.0000	0.0000	0.0000	0.0000	166.4256	313.7432	454.8634	(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)	474.1255	370.4819	320.7937	205.0605	110.2845	0.0000	0.0000	0.0000	0.0000	178.1858	335.9134	487.0057	(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	164.6116	143.7925	149.6068	132.6937	128.4709	113.1500	108.4063	120.8476	122.1823	139.1289	148.5173	160.7459	(64)
Efficiency of water heater	87.4203	87.1810	86.7656	85.9743	84.5012	80.3000	80.3000	80.3000	80.3000	85.5032	86.8888	80.3000	(216)
(217)m	87.4203	87.1810	86.7656	85.9743	84.5012	80.3000	80.3000	80.3000	80.3000	85.5032	86.8888	87.5254	(217)
Fuel for water heating, kWh/month	188.2991	164.9357	172.4265	154.3412	152.0345	140.9091	135.0016	150.4952	152.1573	162.7178	170.9281	183.6563	(219)
Water heating fuel used												1927.9023	(219)
Annual totals kWh/year													
Space heating fuel - main system												2481.8511	(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)												259.5801	(232)
Total delivered energy for all uses												4744.3336	(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	2481.8511	0.2160	536.0798 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1927.9023	0.2160	416.4269 (264)
Space and water heating			952.5067 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	259.5801	0.5190	134.7221 (268)
Total CO2, kg/m2/year			1126.1538 (272)
Emissions per m2 for space and water heating			18.6437 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6370 (272b)
Emissions per m2 for pumps and fans			0.7619 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.6437 * 1.00) + 2.6370 + 0.7619, rounded to 2 d.p.			22.0400 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.0900 (1b)	x 2.3700 (2b)	= 121.0833 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.0833 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1652 (8)
Measured/design AP50					Yes
Infiltration rate					4.1200
Number of sides sheltered					0.3712 (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) =				0.2877 (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	0.3668	0.3596	0.3524	0.3164	0.3092	0.2733	0.2733	0.2661	0.2877	0.3092	0.3236	0.3380 (22b)
Effective ac	0.5673	0.5646	0.5621	0.5501	0.5478	0.5373	0.5373	0.5354	0.5414	0.5478	0.5524	0.5571 (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			2.0600	1.0000	2.0600		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
Heat Loss Floor 1			51.0900	0.1194	6.1023		(28b)
WT-E-01 100	25.6000	6.4200	19.1800	0.2000	3.8360		(29a)
WT-I-01 Common	29.2900	2.0600	27.2300	0.2544	6.9282		(29a)
Flat	8.7000		8.7000	0.1500	1.3050		(30)
Total net area of external elements Aum(A, m ²)			114.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1649		(33)
Party Wall 1			9.0100	0.0000	0.0000		(32)
Party Ceilings 1			42.3900				(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)							16.9156 (36)
Total fabric heat loss						(33) + (36) =	45.0805 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	22.6663	22.5619	22.4596	21.9791	21.8892	21.4708	21.4708	21.3933	21.6320	21.8892	22.0711	22.2612 (38)
Heat transfer coeff	67.7468	67.6424	67.5402	67.0597	66.9698	66.5513	66.5513	66.4738	66.7125	66.9698	67.1516	67.3418 (39)
Average = Sum(39)m / 12 =												67.0593 (39)
HLP	1.3260	1.3240	1.3220	1.3126	1.3108	1.3026	1.3026	1.3011	1.3058	1.3108	1.3144	1.3181 (40)
HLP (average)												1.3126 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7222 (42)
Average daily hot water use (litres/day)												75.1029 (43)
Daily hot water use	82.6131	79.6090	76.6049	73.6008	70.5967	67.5926	67.5926	70.5967	73.6008	76.6049	79.6090	82.6131 (44)
Energy conte	122.5129	107.1506	110.5698	96.3974	92.4956	79.8167	73.9619	84.8723	85.8860	100.0918	109.2581	118.6472 (45)
Energy content (annual)										Total = Sum(45)m =		1181.6603 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	26.0340	22.7695	23.4961	20.4845	19.6553	16.9610	15.7169	18.0354	18.2508	21.2695	23.2173	25.2125 (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	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6985	13.0551	10.6171	8.0378	6.0084	5.0725	5.4810	7.1245	9.5624	12.1417	14.1712	15.1070	(67)
Appliances gains (calculated in Appendix L13, equation L13 or L13a), also see Table 5	150.0645	151.6217	147.6976	139.3436	128.7983	118.8872	112.2659	110.7087	114.6328	122.9867	133.5321	143.4432	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	(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)	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	(71)
Water heating gains (Table 5)	34.9919	33.8832	31.5808	28.4506	26.4184	23.5570	21.1249	24.2411	25.3483	28.5881	32.2463	33.8878	(72)
Total internal gains	248.5883	247.3933	238.7288	224.6655	210.0585	196.3501	187.7052	190.9077	198.3769	212.5499	228.7829	241.2714	(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	6.4200				46.7521		0.4500		0.0000		0.7700		104.0014 (78)	
Solar gains	104.0014	170.3274	216.9670	245.2198	255.5342	245.9169	240.2757	233.3410	226.6476	183.7141	123.2771	89.8668	(83)	
Total gains	352.5896	417.7207	455.6957	469.8852	465.5926	442.2669	427.9810	424.2487	425.0245	396.2640	352.0600	331.1382	(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	52.3702	52.4510	52.5305	52.9068	52.9779	53.3110	53.3110	53.3731	53.1822	52.9779	52.8344	52.6852	
alpha	4.4913	4.4967	4.5020	4.5271	4.5319	4.5541	4.5541	4.5582	4.5455	4.5319	4.5223	4.5123	
util living area	0.9963	0.9917	0.9827	0.9627	0.9156	0.8042	0.6405	0.6668	0.8508	0.9650	0.9924	0.9972	(86)
MIT	19.6106	19.7976	20.0526	20.3589	20.6490	20.8743	20.9666	20.9590	20.8235	20.4390	19.9576	19.5711	(87)
Th 2	19.8205	19.8221	19.8237	19.8310	19.8324	19.8388	19.8388	19.8400	19.8363	19.8324	19.8296	19.8267	(88)
util rest of house	0.9951	0.9888	0.9764	0.9476	0.8770	0.7113	0.4924	0.5236	0.7742	0.9477	0.9893	0.9963	(89)
MIT 2	18.5726	18.7596	19.0127	19.3172	19.5890	19.7778	19.8302	19.8283	19.7404	19.3988	18.9255	18.5381	(90)
Living area fraction									fLA = Living area / (4) =			0.5246	(91)
MIT	19.1171	19.3041	19.5582	19.8636	20.1450	20.3530	20.4263	20.4214	20.3086	19.9445	19.4669	19.0800	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1171	19.3041	19.5582	19.8636	20.1450	20.3530	20.4263	20.4214	20.3086	19.9445	19.4669	19.0800	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9941	0.9872	0.9746	0.9481	0.8889	0.7563	0.5710	0.5994	0.8089	0.9497	0.9880	0.9955	(94)
Ext temp.	350.5006	412.3764	444.1217	445.4853	413.8731	334.4921	244.3758	254.2749	343.8159	376.3488	347.8388	329.6355	(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	1003.8107	974.3297	881.9534	735.2189	565.5622	382.8707	254.6440	267.3208	414.1905	625.7991	830.4596	1002.0450	(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	486.0627	377.6326	325.7468	208.6082	112.8567	0.0000	0.0000	0.0000	0.0000	185.5910	347.4870	500.2727	(98)
Space heating per m2												2544.2577	(98)
										(98) / (4) =		49.7995	(99)

8c. Space cooling requirement

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

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	625.5824	492.4798	505.2011	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7896	0.8712	0.8606	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	493.9673	429.0447	434.7511	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	582.6172	564.7304	561.5255	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	63.8280	100.9502	94.3201	0.0000	0.0000	0.0000	0.0000	(104)
												259.0982	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled Fraction	FC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	15.9570	25.2375	23.5800	0.0000	0.0000	0.0000 (107)
Space cooling											64.7746 (107)
Space cooling per m2											1.2679 (108)
Energy for space heating											49.7995 (99)
Energy for space cooling											1.2679 (108)
Total											51.0674 (109)
Dwelling Fabric Energy Efficiency (DFEE)											51.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.0900 (1b)	x 2.3700 (2b)	= 121.0833 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.0833 (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				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1652 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4152 (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) =				0.3218 (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												
	0.4102	0.4022	0.3942	0.3539	0.3459	0.3057	0.3057	0.2976	0.3218	0.3459	0.3620	0.3781 (22b)
Effective ac	0.5842	0.5809	0.5777	0.5626	0.5598	0.5467	0.5467	0.5443	0.5518	0.5598	0.5655	0.5715 (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			2.0600	1.0000	2.0600		(26)
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114		(27)
Heat Loss Floor 1			51.0900	0.1300	6.6417		(28b)
WT-E-01 100	25.6000	6.4200	19.1800	0.1800	3.4524		(29a)
WT-I-01 Common	29.2900	2.0600	27.2300	0.1800	4.9014		(29a)
Flat	8.7000		8.7000	0.1300	1.1310		(30)
Total net area of external elements Aum(A, m ²)			114.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6979		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.1275 (36)
Total fabric heat loss						(33) + (36) =	42.8254 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	23.3412	23.2106	23.0826	22.4815	22.3690	21.8455	21.8455	21.7485	22.0471	22.3690	22.5966	22.8344 (38)
Heat transfer coeff	66.1666	66.0360	65.9080	65.3069	65.1944	64.6708	64.6708	64.5739	64.8725	65.1944	65.4219	65.6598 (39)
Average = Sum(39)m / 12 =												65.3063 (39)
HLP	1.2951	1.2925	1.2900	1.2783	1.2761	1.2658	1.2658	1.2639	1.2698	1.2761	1.2805	1.2852 (40)
HLP (average)												1.2783 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7222 (42)
Average daily hot water use (litres/day)												75.1029 (43)
Daily hot water use	82.6131	79.6090	76.6049	73.6008	70.5967	67.5926	67.5926	70.5967	73.6008	76.6049	79.6090	82.6131 (44)
Energy conte	122.5129	107.1506	110.5698	96.3974	92.4956	79.8167	73.9619	84.8723	85.8860	100.0918	109.2581	118.6472 (45)
Energy content (annual)										Total = Sum(45)m =		1181.6603 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	26.0340	22.7695	23.4961	20.4845	19.6553	16.9610	15.7169	18.0354	18.2508	21.2695	23.2173	25.2125 (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	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113	86.1113 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6985	13.0551	10.6171	8.0378	6.0084	5.0725	5.4810	7.1245	9.5624	12.1417	14.1712	15.1070 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.0645	151.6217	147.6976	139.3436	128.7983	118.8872	112.2659	110.7087	114.6328	122.9867	133.5321	143.4432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111	31.6111 (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)	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890 (71)
Water heating gains (Table 5)	34.9919	33.8832	31.5808	28.4506	26.4184	23.5570	21.1249	24.2411	25.3483	28.5881	32.2463	33.8878 (72)
Total internal gains	248.5883	247.3933	238.7288	224.6655	210.0585	196.3501	187.7052	190.9077	198.3769	212.5499	228.7829	241.2714 (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	6.4200				46.7521		0.6300		0.7000		0.7700		91.7292 (78)		
Solar gains	91.7292	150.2288	191.3649	216.2838	225.3811	216.8987	211.9232	205.8068	199.9032	162.0359	108.7304	79.2625	(83)		
Total gains	340.3175	397.6221	430.0936	440.9493	435.4396	413.2487	399.6284	396.7144	398.2801	374.5858	337.5133	320.5339	(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	53.6210	53.7270	53.8313	54.3268	54.4206	54.8611	54.8611	54.9435	54.6906	54.4206	54.2313	54.0348
alpha	4.5747	4.5818	4.5888	4.6218	4.6280	4.6574	4.6574	4.6629	4.6460	4.6280	4.6154	4.6023
util living area	0.9968	0.9931	0.9857	0.9690	0.9279	0.8239	0.6627	0.6882	0.8673	0.9702	0.9935	0.9976 (86)
MIT	19.6286	19.8026	20.0469	20.3481	20.6365	20.8678	20.9645	20.9567	20.8162	20.4347	19.9693	19.5947 (87)
Th 2	19.8447	19.8467	19.8486	19.8579	19.8596	19.8677	19.8677	19.8692	19.8646	19.8596	19.8561	19.8525 (88)
util rest of house	0.9957	0.9907	0.9805	0.9562	0.8937	0.7358	0.5156	0.5469	0.7960	0.9553	0.9908	0.9968 (89)
MIT 2	18.6095	18.7840	19.0275	19.3298	19.6030	19.8018	19.8582	19.8565	19.7622	19.4178	18.9581	18.5818 (90)
Living area fraction									fLA = Living area / (4) =			0.5246 (91)
MIT	19.1441	19.3183	19.5623	19.8639	20.1452	20.3610	20.4385	20.4336	20.3151	19.9512	19.4885	19.1131 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1441	19.3183	19.5623	19.8639	20.1452	20.3610	20.4385	20.4336	20.3151	19.9512	19.4885	19.1131 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9949	0.9893	0.9788	0.9563	0.9037	0.7781	0.5937	0.6216	0.8279	0.9567	0.9897	0.9961 (94)
Ext temp.	338.5695	393.3516	420.9955	421.6615	393.4941	321.5440	237.2593	246.6110	329.7300	358.3808	334.0330	319.2680 (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	982.1837	952.1266	860.9070	716.0213	550.5779	372.5679	248.2403	260.4669	403.1867	609.6486	810.4819	979.1928 (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	478.8490	375.4968	327.2941	211.9390	116.8704	0.0000	0.0000	0.0000	0.0000	186.9432	343.0432	490.9840 (98)
												2531.4198 (98)
										(98) / (4) =		49.5482 (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	607.9059	478.5642	490.7615	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7786	0.8636	0.8531	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	473.3275	413.2708	418.6524	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	548.6999	531.5911	529.3426	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	54.2681	88.0303	82.3536	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												224.6519 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												

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	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	13.5670	22.0076	20.5884	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												56.1630 (107)
Energy for space heating												1.0993 (108)
Energy for space cooling												49.5482 (99)
Total												1.0993 (108)
Target Fabric Energy Efficiency (TFEE)												50.6475 (109)
												58.2 (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	51.0900 (1b)	x 2.3700 (2b)	= 121.0833 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.0833 (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					4.1200
Infiltration rate					0.2060 (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) =				0.1597 (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	0.1676	0.1597	0.1597	0.1477	0.1477	0.1317	0.1357	0.1277	0.1317	0.1397	0.1397	0.1517 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.0600	1.0000	2.0600		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
Heat Loss Floor 1			51.0900	0.1194	6.1023		(28b)
WT-E-01 100	25.6000	6.4200	19.1800	0.2000	3.8360		(29a)
WT-I-01 Common	29.2900	2.0600	27.2300	0.2544	6.9282		(29a)
Flat	8.7000		8.7000	0.1500	1.3050		(30)
Total net area of external elements Aum(A, m ²)			114.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1649		(33)
Party Wall 1			9.0100	0.0000	0.0000		(32)
Party Ceilings 1			42.3900				(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)							16.9156 (36)
Total fabric heat loss							(33) + (36) = 45.0805 (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	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787 (38)
Heat transfer coeff	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593 (39)
Average = Sum(39)m / 12 =												65.0593 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734 (40)
HLP (average)												1.2734 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7222 (42)
Average daily hot water use (litres/day)												75.1029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.6131	79.6090	76.6049	73.6008	70.5967	67.5926	67.5926	70.5967	73.6008	76.6049	79.6090	82.6131 (44)
Energy conte	122.5129	107.1506	110.5698	96.3974	92.4956	79.8167	73.9619	84.8723	85.8860	100.0918	109.2581	118.6472 (45)
Energy content (annual)												Total = Sum(45)m = 1181.6603 (45)
Distribution loss (46)m = 0.15 x (45)m												

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CALCULATION OF HEAT DEMAND 09 Jan 2014

	18.3769	16.0726	16.5855	14.4596	13.8743	11.9725	11.0943	12.7309	12.8829	15.0138	16.3887	17.7971 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	13.9995	12.6300	13.9598	13.4831	13.9133	13.4423	13.8765	13.9004	13.4645	13.9406	13.5216	13.9918 (61)
Total heat required for water heating calculated for each month	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (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	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	44.2354	38.7851	40.2544	35.4229	34.2331	29.8996	28.0615	31.6951	31.9232	36.7657	39.7087	42.9481 (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	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.7463	32.6377	26.5428	20.0946	15.0209	12.6813	13.7026	17.8112	23.9061	30.3543	35.4279	37.7675 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.9768	226.3010	220.4441	207.9756	192.2363	177.4435	167.5611	165.2369	171.0938	183.5623	199.3016	214.0943 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556 (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)	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890 (71)
Water heating gains (Table 5)	59.4562	57.7159	54.1054	49.1985	46.0122	41.5272	37.7170	42.6010	44.3378	49.4162	55.1510	57.7260 (72)
Total internal gains	404.6793	401.1546	385.5924	361.7687	337.7695	316.1522	303.4808	310.1491	323.8377	347.8329	374.3806	394.0880 (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					6.4200	50.9848	0.4500	0.0000			0.7700	113.4173 (78)	
Solar gains	113.4173	166.6978	209.4144	244.7589	250.1972	258.7366	249.6056	246.2699	237.2720	191.7796	137.6126	97.1414 (83)	
Total gains	518.0966	567.8524	595.0068	606.5276	587.9668	574.8888	553.0864	556.4191	561.1097	539.6125	511.9932	491.2294 (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	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336
alpha	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356
util living area	0.9793	0.9675	0.9417	0.8861	0.7690	0.5476	0.3625	0.3717	0.6333	0.8699	0.9591	0.9831 (86)
MIT	20.0525	20.1865	20.4166	20.6679	20.8772	20.9811	20.9978	20.9975	20.9605	20.7444	20.3622	20.0085 (87)
Th 2	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617 (88)
util rest of house	0.9728	0.9575	0.9231	0.8487	0.6946	0.4317	0.2306	0.2408	0.5257	0.8209	0.9442	0.9777 (89)
MIT 2	19.0412	19.1711	19.3916	19.6220	19.7933	19.8562	19.8615	19.8615	19.8468	19.6918	19.3434	18.9985 (90)
Living area fraction									fLA = Living area / (4) =			0.5246 (91)
MIT	19.5717	19.7037	19.9293	20.1706	20.3619	20.4463	20.4576	20.4574	20.4310	20.2440	19.8779	19.5283 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4217	19.5537	19.7793	20.0206	20.2119	20.2963	20.3076	20.3074	20.2810	20.0940	19.7279	19.3783 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9697	0.9542	0.9216	0.8546	0.7193	0.4772	0.2826	0.2925	0.5672	0.8322	0.9421	0.9747 (94)
Useful gains	502.3794	541.8433	548.3372	518.3214	422.9264	274.3493	156.3121	162.7389	318.2522	449.0666	482.3647	478.8140 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	931.7583	907.8190	805.3895	658.4405	469.2000	279.5128	156.6363	163.1299	330.5647	552.6108	763.0070	928.9363 (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	319.4579	245.9357	191.2469	100.8858	34.4276	0.0000	0.0000	0.0000	0.0000	77.0369	202.0624	334.8910 (98)
Space heating												1505.9443 (98)
RHI space heating demand												1506 (98)

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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	51.0900 (1b)	x 2.3700 (2b)	= 121.0833 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.0833 (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					4.1200
Infiltration rate					0.2060 (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) =				0.1597 (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	0.2036	0.1996	0.1956	0.1756	0.1716	0.1517	0.1517	0.1477	0.1597	0.1716	0.1796	0.1876 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.0600	1.0000	2.0600		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
Heat Loss Floor 1			51.0900	0.1194	6.1023		(28b)
WT-E-01 100	25.6000	6.4200	19.1800	0.2000	3.8360		(29a)
WT-I-01 Common	29.2900	2.0600	27.2300	0.2544	6.9282		(29a)
Flat	8.7000		8.7000	0.1500	1.3050		(30)
Total net area of external elements Aum(A, m ²)			114.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1649		(33)
Party Wall 1			9.0100	0.0000	0.0000		(32)
Party Ceilings 1			42.3900				(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)							16.9156 (36)
Total fabric heat loss							(33) + (36) = 45.0805 (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	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787 (38)
Heat transfer coeff	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593 (39)
Average = Sum(39)m / 12 =												65.0593 (39)
HLP	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734 (40)
HLP (average)												1.2734 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7222 (42)
Average daily hot water use (litres/day)												75.1029 (43)
Daily hot water use	82.6131	79.6090	76.6049	73.6008	70.5967	67.5926	67.5926	70.5967	73.6008	76.6049	79.6090	82.6131 (44)
Energy conte	122.5129	107.1506	110.5698	96.3974	92.4956	79.8167	73.9619	84.8723	85.8860	100.0918	109.2581	118.6472 (45)
Energy content (annual)												Total = Sum(45)m = 1181.6603 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	18.3769	16.0726	16.5855	14.4596	13.8743	11.9725	11.0943	12.7309	12.8829	15.0138	16.3887	17.7971 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	13.9995	12.6300	13.9598	13.4831	13.9133	13.4423	13.8765	13.9004	13.4645	13.9406	13.5216	13.9918 (61)
Total heat required for water heating calculated for each month	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (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	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (64)
Heat gains from water heating, kWh/month	44.2354	38.7851	40.2544	35.4229	34.2331	29.8996	28.0615	31.6951	31.9232	36.7657	39.7087	42.9481 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.7463	32.6377	26.5428	20.0946	15.0209	12.6813	13.7026	17.8112	23.9061	30.3543	35.4279	37.7675 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.9768	226.3010	220.4441	207.9756	192.2363	177.4435	167.5611	165.2369	171.0938	183.5623	199.3016	214.0943 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556 (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)	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890 (71)
Water heating gains (Table 5)	59.4562	57.7159	54.1054	49.1985	46.0122	41.5272	37.7170	42.6010	44.3378	49.4162	55.1510	57.7260 (72)
Total internal gains	404.6793	401.1546	385.5924	361.7687	337.7695	316.1522	303.4808	310.1491	323.8377	347.8329	374.3806	394.0880 (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				6.4200	46.7521	0.4500		0.0000		0.7700		104.0014 (78)
Solar gains	104.0014	170.3274	216.9670	245.2198	255.5342	245.9169	240.2757	233.3410	226.6476	183.7141	123.2771	89.8668 (83)
Total gains	508.6807	571.4821	602.5593	606.9885	593.3037	562.0690	543.7565	543.4902	550.4853	531.5470	497.6577	483.9547 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336
alpha	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356
util living area	0.9840	0.9717	0.9508	0.9108	0.8305	0.6822	0.5134	0.5345	0.7299	0.9058	0.9708	0.9871 (86)
MIT	19.9466	20.1152	20.3340	20.5786	20.7981	20.9408	20.9872	20.9842	20.9153	20.6491	20.2427	19.8938 (87)
Th 2	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617 (88)
util rest of house	0.9791	0.9632	0.9357	0.8818	0.7741	0.5836	0.3872	0.4103	0.6396	0.8699	0.9604	0.9831 (89)
MIT 2	18.9369	19.1013	19.3125	19.5419	19.7328	19.8360	19.8587	19.8577	19.8208	19.6098	19.2283	18.8852 (90)
Living area fraction	19.4665	19.6332	19.8484	20.0857	20.2916	20.4155	20.4507	20.4486	20.3950	20.1550	19.7605	19.4143 (92)
Temperature adjustment	19.3165	19.4832	19.6984	19.9357	20.1416	20.2655	20.3007	20.2986	20.2450	20.0050	19.6105	19.2643 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	496.5380	548.4862	562.2939	536.5793	468.3444	348.8147	237.6601	249.6346	370.0374	465.1787	476.5698	474.4757 (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	976.9661	948.7698	858.6776	717.9768	549.2050	368.5951	240.7640	253.6426	399.7863	611.8810	813.9214	980.0719 (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	357.4385	268.9906	220.5095	130.6062	60.1603	0.0000	0.0000	0.0000	0.0000	109.1465	242.8931	376.1636 (98)
Space heating												1765.9083 (98)
Space heating per m2										(98) / (4) =		34.5647 (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													1951.2799 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	357.4385	268.9906	220.5095	130.6062	60.1603	0.0000	0.0000	0.0000	0.0000	109.1465	242.8931	376.1636	(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)	394.9596	297.2272	243.6569	144.3162	66.4755	0.0000	0.0000	0.0000	0.0000	120.6039	268.3902	415.6504	(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	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390	(64)
Efficiency of water heater (217)m	89.5924	89.4894	89.3184	89.0093	88.4293	87.3000	87.3000	87.3000	87.3000	88.8362	89.3997	89.6434	(216)
Fuel for water heating, kWh/month	152.3705	133.8490	139.4222	123.4484	120.3322	106.8258	100.6168	113.1417	113.8036	128.3626	137.3378	147.9629	(219)
Water heating fuel used												1517.4733	(219)
Annual totals kWh/year													
Space heating fuel - main system												1951.2799	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													27.1808 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													102.1808 (231)
Electricity for lighting (calculated in Appendix L)													259.5801 (232)
Total delivered energy for all uses													3830.5141 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1951.2799	3.4800	67.9045 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1517.4733	3.4800	52.8081 (247)
Mechanical ventilation fans	27.1808	13.1900	3.5851 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	259.5801	13.1900	34.2386 (250)
Additional standing charges			120.0000 (251)
Total energy cost			288.4289 (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] =	1.2607 (257)
SAP value		82.4133
SAP rating (Section 12)		82 (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	1951.2799	0.2160	421.4765 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1517.4733	0.2160	327.7742 (264)
Space and water heating			749.2507 (265)
Pumps and fans	102.1808	0.5190	53.0318 (267)
Energy for lighting	259.5801	0.5190	134.7221 (268)
Total kg/year			937.0046 (272)
CO2 emissions per m2			18.3400 (273)
EI value			86.9332
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	$3.48 / 0.8858 = 3.929$, stars = 4
Water heating environmental impact	$0.216 / 0.8858 = 0.2439$, 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	51.0900 (1b)	x 2.3700 (2b)	= 121.0833 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 121.0833 (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					4.1200
Infiltration rate					0.2060 (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) =				0.1597 (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	0.1676	0.1597	0.1597	0.1477	0.1477	0.1317	0.1357	0.1277	0.1317	0.1397	0.1397	0.1517 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.0600	1.0000	2.0600		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
Heat Loss Floor 1			51.0900	0.1194	6.1023		(28b)
WT-E-01 100	25.6000	6.4200	19.1800	0.2000	3.8360		(29a)
WT-I-01 Common	29.2900	2.0600	27.2300	0.2544	6.9282		(29a)
Flat	8.7000		8.7000	0.1500	1.3050		(30)
Total net area of external elements Aum(A, m ²)			114.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1649		(33)
Party Wall 1			9.0100	0.0000	0.0000		(32)
Party Ceilings 1			42.3900				(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)							16.9156 (36)
Total fabric heat loss							(33) + (36) = 45.0805 (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	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787	19.9787 (38)
Heat transfer coeff	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593 (39)
Average = Sum(39)m / 12 =	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593	65.0593 (39)
HLP	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734 (40)
HLP (average)	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734	1.2734 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7222 (42)
Average daily hot water use (litres/day)												75.1029 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.6131	79.6090	76.6049	73.6008	70.5967	67.5926	67.5926	70.5967	73.6008	76.6049	79.6090	82.6131 (44)
Energy content (annual)	122.5129	107.1506	110.5698	96.3974	92.4956	79.8167	73.9619	84.8723	85.8860	100.0918	109.2581	118.6472 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1181.6603 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	18.3769	16.0726	16.5855	14.4596	13.8743	11.9725	11.0943	12.7309	12.8829	15.0138	16.3887	17.7971 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	13.9995	12.6300	13.9598	13.4831	13.9133	13.4423	13.8765	13.9004	13.4645	13.9406	13.5216	13.9918 (61)
Total heat required for water heating calculated for each month	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (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	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390 (64)
Heat gains from water heating, kWh/month	44.2354	38.7851	40.2544	35.4229	34.2331	29.8996	28.0615	31.6951	31.9232	36.7657	39.7087	42.9481 (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	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	103.3335	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.7463	32.6377	26.5428	20.0946	15.0209	12.6813	13.7026	17.8112	23.9061	30.3543	35.4279	37.7675	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.9768	226.3010	220.4441	207.9756	192.2363	177.4435	167.5611	165.2369	171.0938	183.5623	199.3016	214.0943	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	47.0556	(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)	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	-68.8890	(71)
Water heating gains (Table 5)	59.4562	57.7159	54.1054	49.1985	46.0122	41.5272	37.7170	42.6010	44.3378	49.4162	55.1510	57.7260	(72)
Total internal gains	404.6793	401.1546	385.5924	361.7687	337.7695	316.1522	303.4808	310.1491	323.8377	347.8329	374.3806	394.0880	(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			6.4200			50.9848	0.4500		0.0000		0.7700		113.4173 (78)
Solar gains	113.4173	166.6978	209.4144	244.7589	250.1972	258.7366	249.6056	246.2699	237.2720	191.7796	137.6126	97.1414	(83)
Total gains	518.0966	567.8524	595.0068	606.5276	587.9668	574.8888	553.0864	556.4191	561.1097	539.6125	511.9932	491.2294	(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	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	54.5336	
alpha	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	4.6356	
util living area	0.9793	0.9675	0.9417	0.8861	0.7690	0.5476	0.3625	0.3717	0.6333	0.8699	0.9591	0.9831	(86)
MIT	20.0525	20.1865	20.4166	20.6679	20.8772	20.9811	20.9978	20.9975	20.9605	20.7444	20.3622	20.0085	(87)
Th 2	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	19.8617	(88)
util rest of house	0.9728	0.9575	0.9231	0.8487	0.6946	0.4317	0.2306	0.2408	0.5257	0.8209	0.9442	0.9777	(89)
MIT 2	19.0412	19.1711	19.3916	19.6220	19.7933	19.8562	19.8615	19.8615	19.8468	19.6918	19.3434	18.9985	(90)
Living area fraction	19.5717	19.7037	19.9293	20.1706	20.3619	20.4463	20.4576	20.4574	20.4310	20.2440	19.8779	19.5283	(92)
Temperature adjustment	19.4217	19.5537	19.7793	20.0206	20.2119	20.2963	20.3076	20.3074	20.2810	20.0940	19.7279	19.3783	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	502.3794	541.8433	548.3372	518.3214	422.9264	274.3493	156.3121	162.7389	318.2522	449.0666	482.3647	478.8140	(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	931.7583	907.8190	805.3895	658.4405	469.2000	279.5128	156.6363	163.1299	330.5647	552.6108	763.0070	928.9363	(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	319.4579	245.9357	191.2469	100.8858	34.4276	0.0000	0.0000	0.0000	0.0000	77.0369	202.0624	334.8910	(98)
Space heating												1505.9443	(98)
Space heating per m2												29.4763	(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													1664.0268 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	319.4579	245.9357	191.2469	100.8858	34.4276	0.0000	0.0000	0.0000	0.0000	77.0369	202.0624	334.8910	(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)	352.9922	271.7522	211.3226	111.4760	38.0415	0.0000	0.0000	0.0000	0.0000	85.1237	223.2734	370.0453	(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	136.5124	119.7806	124.5296	109.8805	106.4089	93.2590	87.8384	98.7727	99.3505	114.0324	122.7796	132.6390	(64)
Efficiency of water heater (217)m	89.5176	89.4264	89.2104	88.8030	88.0612	87.3000	87.3000	87.3000	87.3000	88.5626	89.2633	89.5686	(216)
Fuel for water heating, kWh/month	152.4978	133.9432	139.5909	123.7351	120.8352	106.8258	100.6168	113.1417	113.8036	128.7591	137.5477	148.0866	(219)
Water heating fuel used												1519.3834	(219)
Annual totals kWh/year													
Space heating fuel - main system												1664.0268	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													27.1808 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													102.1808 (231)
Electricity for lighting (calculated in Appendix L)													259.5801 (232)
Total delivered energy for all uses													3545.1712 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1664.0268	3.8700	64.3978 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1519.3834	3.8700	58.8001 (247)
Mechanical ventilation fans	27.1808	18.9000	5.1372 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	259.5801	18.9000	49.0606 (250)
Additional standing charges			93.0000 (251)
Total energy cost			284.5708 (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	1664.0268	0.2160	359.4298 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1519.3834	0.2160	328.1868 (264)
Space and water heating			687.6166 (265)
Pumps and fans	102.1808	0.5190	53.0318 (267)
Energy for lighting	259.5801	0.5190	134.7221 (268)
Total kg/year			875.3705 (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	1664.0268	1.2200	2030.1127 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1519.3834	1.2200	1853.6478 (264)
Space and water heating			3883.7605 (265)
Pumps and fans	102.1808	3.0700	313.6950 (267)
Energy for lighting	259.5801	3.0700	796.9110 (268)
Primary energy kWh/year			4994.3665 (272)
Primary energy kWh/m2/year			97.7562 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 82
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
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	Not applicable
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Not applicable
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
L2	Not applicable
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 82	
Potential environmental impact rating:			B 87

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	£68	£68	£0
Mains gas	£216	£216	£0
Space heating	£177	£177	£0
Water heating	£59	£59	£0
Lighting	£49	£49	£0
Total cost of fuels	£284	£284	£0
Total cost of uses	£285	£285	£0
Delivered energy	69 kWh/m²	69 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	17 kg/m²	17 kg/m²	0 kg/m²
Primary energy	98 kWh/m²	98 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	North
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	119.87 (P1)
Transmission heat loss coefficient	45.08 (37)
Summer heat loss coefficient	164.95 (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	6.4200	112.2060	0.4500	0.0000
total:				291.7468

Solar gains	Jun	Jul	Aug	
Internal gains	302	292	288	(P4)
Total summer gains	313	300	307	
	616	592	595	(P5)
Summer gain/loss ratio	3.73	3.59	3.61	(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	19.98	21.74	21.66	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			