

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW018_210_As_Built				Issued on Date	15/07/2021
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	83 B	DER	19.51	TER	20.39	
Environmental	86 B	% DER<TER	4.30			
CO ₂ Emissions (t/year)	1.10	DFEE	51.05	TFEE	57.48	
General Requirements Compliance	Pass	% DFEE<TFEE	11.19			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Top-floor flat, total floor area 69 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) 20.39 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.51 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 57.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 51.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.25 (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: 3.26 (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 North: 10.22 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
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	68.8200 (1b)	x 2.4000 (2b)	= 165.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1680 (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					3.2600
Infiltration rate					0.1630 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1386 (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	0.1767	0.1732	0.1697	0.1524	0.1489	0.1316	0.1316	0.1282	0.1386	0.1489	0.1559	0.1628 (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			2.0600	1.0000	2.0600		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-01	44.3500	10.2200	34.1300	0.2000	6.8260		(29a)
WT-I-01 Common	16.6100	2.0600	14.5500	0.2544	3.7020		(29a)
Flat	68.8200		68.8200	0.1500	10.3230		(30)
Total net area of external elements Aum(A, m2)			129.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5403		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Floor 1			68.8200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6173 (36)
Total fabric heat loss						(33) + (36) =	51.1575 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527 (38)
Average = Sum(39)m / 12 =	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394 (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												2.2171 (42)
Average daily hot water use (litres/day)												86.8571 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	95.5428	92.0685	88.5942	85.1199	81.6456	78.1714	78.1714	81.6456	85.1199	88.5942	92.0685	95.5428 (44)
Energy conte	141.6872	123.9205	127.8748	111.4844	106.9719	92.3086	85.5375	98.1556	99.3278	115.7570	126.3579	137.2164 (45)
Energy content (annual)												Total = Sum(45)m = 1366.5997 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.2531	18.5881	19.1812	16.7227	16.0458	13.8463	12.8306	14.7233	14.8992	17.3636	18.9537	20.5825 (46)

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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0815	12.6991	14.0285	13.5405	13.9662	13.4860	13.9170	13.9489	13.5157	14.0027	13.5920	14.0712 (61)
Total heat required for water heating calculated for each month												
	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (64)
Output from w/h	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876 (64)
								Total per year (kWh/year) = Sum(64)m =				1531.4490 (65)
Heat gains from water heating, kWh/month												
	50.6313	44.3783	46.0255	40.4537	39.0597	34.0641	31.9205	36.1239	36.4054	41.9899	45.4120	49.1423 (65)

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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													3444.9828 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	577.0889	474.1299	418.0793	256.0815	115.2372	0.0000	0.0000	0.0000	0.0000	254.5283	429.5603	593.0040	(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)	637.6673	523.9005	461.9660	282.9630	127.3340	0.0000	0.0000	0.0000	0.0000	281.2468	474.6523	655.2530	(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	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(64)
Efficiency of water heater	89.8004	89.7640	89.6671	89.4247	88.8326	87.3000	87.3000	87.3000	87.3000	89.3936	89.6921	87.3000	(216)
Fuel for water heating, kWh/month	173.4610	152.1987	158.2557	139.8104	136.1416	121.1851	113.9228	128.4129	129.2595	145.1555	156.0337	168.4142	(219)
Water heating fuel used												1722.2510	(219)
Annual totals kWh/year													
Space heating fuel - main system												3444.9828	(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)													37.0769 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													112.0769 (231)
Electricity for lighting (calculated in Appendix L)													324.4402 (232)
Total delivered energy for all uses													5603.7509 (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	3444.9828	0.2160	744.1163	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1722.2510	0.2160	372.0062	(264)
Space and water heating			1116.1225	(265)
Pumps and fans	112.0769	0.5190	58.1679	(267)
Energy for lighting	324.4402	0.5190	168.3845	(268)
Total CO2, kg/year			1342.6749	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.5100	(273)

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

DER			19.5100	ZC1
Total Floor Area		TFA	68.8200	
Assumed number of occupants		N	2.2171	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.7499	ZC2
CO2 emissions from cooking, equation (L16)			2.5023	ZC3
Total CO2 emissions			38.7623	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			38.7623	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.8200 (1b)	x 2.4000 (2b)	= 165.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1211 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3711 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3154 (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	0.4022	0.3943	0.3864	0.3470	0.3391	0.2997	0.2997	0.2918	0.3154	0.3391	0.3549	0.3706 (22b)
Effective ac	0.5809	0.5777	0.5747	0.5602	0.5575	0.5449	0.5449	0.5426	0.5497	0.5575	0.5630	0.5687 (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)			10.2200	1.3258	13.5492		(27)
WT-E-01	44.3500	10.2200	34.1300	0.1800	6.1434		(29a)
WT-I-01 Common	16.6100	2.0600	14.5500	0.1800	2.6190		(29a)
Flat	68.8200		68.8200	0.1300	8.9466		(30)
Total net area of external elements Aum, m ²			129.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3182		(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)							14.2452 (36)
Total fabric heat loss						(33) + (36) =	47.5634 (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	31.6605	31.4894	31.3216	30.5336	30.3862	29.6998	29.6998	29.5727	29.9642	30.3862	30.6844	30.9962 (38)
Heat transfer coeff	79.2240	79.0528	78.8850	78.0970	77.9496	77.2633	77.2633	77.1362	77.5276	77.9496	78.2479	78.5597 (39)
Average = Sum(39)m / 12 =												78.0963 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1512	1.1487	1.1463	1.1348	1.1327	1.1227	1.1227	1.1208	1.1265	1.1327	1.1370	1.1415 (40)
HLP (average)												1.1348 (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												2.2171 (42)
Average daily hot water use (litres/day)												86.8571 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	95.5428	92.0685	88.5942	85.1199	81.6456	78.1714	78.1714	81.6456	85.1199	88.5942	92.0685	95.5428 (44)
Energy conte	141.6872	123.9205	127.8748	111.4844	106.9719	92.3086	85.5375	98.1556	99.3278	115.7570	126.3579	137.2164 (45)
Energy content (annual)										Total = Sum(45)m =		1366.5997 (45)
Distribution loss (46)m = 0.15 x (45)m	21.2531	18.5881	19.1812	16.7227	16.0458	13.8463	12.8306	14.7233	14.8992	17.3636	18.9537	20.5825 (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	48.6875	42.3767	45.1466	41.9769	41.6057	38.5503	39.8353	41.6057	41.9769	45.1466	45.4036	48.6875 (61)
Total heat required for water heating calculated for each month	190.3747	166.2972	173.0215	153.4613	148.5776	130.8589	125.3728	139.7613	141.3048	160.9037	171.7615	185.9040 (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	190.3747	166.2972	173.0215	153.4613	148.5776	130.8589	125.3728	139.7613	141.3048	160.9037	171.7615	185.9040 (64)
Heat gains from water heating, kWh/month	59.2829	51.7977	53.8050	47.5628	45.9696	40.3302	38.4000	43.0382	43.5207	49.7759	53.3649	57.7964 (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	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3711	16.3171	13.2700	10.0462	7.5097	6.3400	6.8506	8.9046	11.9518	15.1755	17.7121	18.8817	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.5275	196.5461	191.4593	180.6302	166.9603	154.1126	145.5295	143.5109	148.5977	159.4269	173.0967	185.9444	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	(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)	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	(71)
Water heating gains (Table 5)	79.6813	77.0800	72.3186	66.0594	61.7871	56.0141	51.6130	57.8470	60.4455	66.9031	74.1179	77.6833	(72)
Total internal gains	351.8370	349.2002	336.3049	315.9929	295.5142	275.7238	263.2501	269.5196	280.2520	300.7625	324.1837	341.7665	(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	
North			10.2200		10.6334		0.6300		0.7000		0.7700		33.2120 (74)	
Solar gains			33.2120	63.4698	107.8506	173.2358	233.3645	249.8236	233.2422	185.0479	129.6714	75.5525	40.9712	27.6871 (83)
Total gains			385.0490	412.6700	444.1556	489.2287	528.8786	525.5474	496.4924	454.5676	409.9235	376.3150	365.1550	369.4536 (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	60.3247	60.4554	60.5839	61.1952	61.3110	61.8556	61.8556	61.9575	61.6447	61.3110	61.0773	60.8349	
alpha	5.0216	5.0304	5.0389	5.0797	5.0874	5.1237	5.1237	5.1305	5.1096	5.0874	5.0718	5.0557	
util living area	0.9986	0.9977	0.9948	0.9827	0.9363	0.8102	0.6503	0.7190	0.9253	0.9891	0.9974	0.9988	(86)
MIT	19.7195	19.8247	20.0414	20.3647	20.6855	20.9058	20.9766	20.9616	20.7867	20.3998	20.0104	19.7005	(87)
Th 2	19.9593	19.9613	19.9632	19.9725	19.9743	19.9823	19.9823	19.9839	19.9792	19.9743	19.9707	19.9671	(88)
util rest of house	0.9981	0.9968	0.9928	0.9752	0.9065	0.7259	0.5169	0.5886	0.8773	0.9831	0.9963	0.9985	(89)
MIT 2	18.2481	18.4033	18.7210	19.1955	19.6423	19.9134	19.9729	19.9660	19.7862	19.2509	18.6819	18.2259	(90)
Living area fraction	18.7997	18.9362	19.2160	19.6339	20.0334	20.2854	20.3492	20.3393	20.1613	19.6816	19.1799	18.7787	(91)
MIT	18.7997	18.9362	19.2160	19.6339	20.0334	20.2854	20.3492	20.3393	20.1613	19.6816	19.1799	18.7787	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7997	18.9362	19.2160	19.6339	20.0334	20.2854	20.3492	20.3393	20.1613	19.6816	19.1799	18.7787	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9972	0.9957	0.9907	0.9719	0.9085	0.7537	0.5675	0.6378	0.8877	0.9808	0.9951	0.9978	(94)
Ext temp.	383.9896	410.8757	440.0448	475.4964	480.5043	396.1027	281.7486	289.9234	363.9028	369.0798	363.3486	368.6319	(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	1148.7256	1109.5995	1003.0995	838.2828	649.5825	439.2732	289.6726	303.8605	469.9149	707.9070	945.2278	1145.3002	(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	568.9636	469.5424	418.9127	261.2062	125.7942	0.0000	0.0000	0.0000	0.0000	252.0874	418.9530	577.8412	(98)
												3093.3007	(98)
												44.9477	(99)

8c. Space cooling requirement

Not applicable

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

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

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3311.8852 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	568.9636	469.5424	418.9127	261.2062	125.7942	0.0000	0.0000	0.0000	0.0000	252.0874	418.9530	577.8412	(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)	609.1687	502.7220	448.5147	279.6641	134.6833	0.0000	0.0000	0.0000	0.0000	269.9008	448.5578	618.6737	(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	190.3747	166.2972	173.0215	153.4613	148.5776	130.8589	125.3728	139.7613	141.3048	160.9037	171.7615	185.9040	(64)
Efficiency of water heater	87.6365	87.5209	87.1943	86.3792	84.6354	80.3000	80.3000	80.3000	80.3000	86.1770	87.2105	80.3000	(216)
Fuel for water heating, kWh/month	217.2323	190.0086	198.4321	177.6601	175.5503	162.9625	156.1305	174.0489	175.9711	186.7130	196.9505	211.9420	(219)
Water heating fuel used												2223.6018	(219)
Annual totals kWh/year													
Space heating fuel - main system													3311.8852 (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)													324.4402 (232)
Total delivered energy for all uses													5934.9272 (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	3311.8852	0.2160	715.3672 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2223.6018	0.2160	480.2980 (264)
Space and water heating			1195.6652 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	324.4402	0.5190	168.3845 (268)
Total CO2, kg/m2/year			1402.9747 (272)
Emissions per m2 for space and water heating			17.3738 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4467 (272b)
Emissions per m2 for pumps and fans			0.5656 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.3738 * 1.00) + 2.4467 + 0.5656, rounded to 2 d.p.			20.3900 (273)

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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	68.8200 (1b)	x 2.4000 (2b)	= 165.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1680 (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) =
Measured/design AP50					Yes
Infiltration rate					3.2600
Number of sides sheltered					0.2841 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2415 (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	0.3079	0.3018	0.2958	0.2656	0.2596	0.2294	0.2294	0.2234	0.2415	0.2596	0.2717	0.2837 (22b)
	0.5474	0.5456	0.5438	0.5353	0.5337	0.5263	0.5263	0.5249	0.5292	0.5337	0.5369	0.5403 (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)			10.2200	1.2357	12.6293		(27)
WT-E-01	44.3500	10.2200	34.1300	0.2000	6.8260		(29a)
WT-I-01 Common	16.6100	2.0600	14.5500	0.2544	3.7020		(29a)
Flat	68.8200		68.8200	0.1500	10.3230		(30)
Total net area of external elements Aum, m ²			129.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5403		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Floor 1			68.8200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6173 (36)
Total fabric heat loss						(33) + (36) =	51.1575 (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	29.8360	29.7357	29.6374	29.1756	29.0891	28.6869	28.6869	28.6124	28.8418	29.0891	29.2639	29.4467 (38)
Heat transfer coeff	80.9936	80.8932	80.7949	80.3331	80.2467	79.8444	79.8444	79.7699	79.9994	80.2467	80.4215	80.6042 (39)
Average = Sum(39)m / 12 =												80.3327 (39)
HLP	1.1769	1.1754	1.1740	1.1673	1.1660	1.1602	1.1602	1.1591	1.1624	1.1660	1.1686	1.1712 (40)
HLP (average)												1.1673 (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												2.2171 (42)
Average daily hot water use (litres/day)												86.8571 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	95.5428	92.0685	88.5942	85.1199	81.6456	78.1714	78.1714	81.6456	85.1199	88.5942	92.0685	95.5428 (44)
Energy content (annual)	141.6872	123.9205	127.8748	111.4844	106.9719	92.3086	85.5375	98.1556	99.3278	115.7570	126.3579	137.2164 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1366.5997 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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	30.1085	26.3331	27.1734	23.6904	22.7315	19.6156	18.1767	20.8581	21.1072	24.5984	26.8510	29.1585 (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	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3711	16.3171	13.2700	10.0462	7.5097	6.3400	6.8506	8.9046	11.9518	15.1755	17.7121	18.8817	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.5275	196.5461	191.4593	180.6302	166.9603	154.1126	145.5295	143.5109	148.5977	159.4269	173.0967	185.9444	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	(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)	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	(71)
Water heating gains (Table 5)	40.4684	39.1862	36.5234	32.9034	30.5531	27.2439	24.4311	28.0350	29.3155	33.0623	37.2931	39.1915	(72)
Total internal gains	309.6242	308.3064	297.5097	279.8368	261.2802	243.9535	233.0683	236.7077	246.1221	263.9218	284.3589	300.2748	(73)

6. Solar gains

[Jan]													
	Area				Solar flux		g		FF		Access		Gains
	m2				Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
North	10.2200				10.6334		0.4500		0.0000		0.7700		37.6553 (74)
Solar gains	37.6553	71.9612	122.2796	196.4125	264.5855	283.2467	264.4470	209.8049	147.0197	85.6604	46.4526	31.3913	(83)
Total gains	347.2794	380.2676	419.7894	476.2493	525.8657	527.2002	497.5152	446.5126	393.1418	349.5822	330.8116	331.6661	(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	59.0067	59.0799	59.1518	59.4919	59.5559	59.8560	59.8560	59.9119	59.7401	59.5559	59.4265	59.2918	
alpha	4.9338	4.9387	4.9435	4.9661	4.9704	4.9904	4.9904	4.9941	4.9827	4.9704	4.9618	4.9528	
util living area	0.9991	0.9984	0.9960	0.9850	0.9408	0.8198	0.6644	0.7423	0.9389	0.9923	0.9983	0.9993	(86)
MIT	19.6343	19.7466	19.9763	20.3159	20.6577	20.8927	20.9717	20.9517	20.7510	20.3364	19.9288	19.6097	(87)
Th 2	19.9385	19.9397	19.9409	19.9463	19.9473	19.9520	19.9520	19.9529	19.9502	19.9473	19.9452	19.9431	(88)
util rest of house	0.9988	0.9978	0.9944	0.9784	0.9123	0.7354	0.5264	0.6091	0.8964	0.9879	0.9976	0.9990	(89)
MIT 2	18.6895	18.8025	19.0325	19.3730	19.6995	19.8980	19.9442	19.9373	19.7927	19.3965	18.9891	18.6685	(90)
Living area fraction									fLA = Living area / (4) =			0.3749	(91)
MIT	19.0437	19.1564	19.3863	19.7264	20.0587	20.2709	20.3294	20.3176	20.1520	19.7489	19.3414	19.0213	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0437	19.1564	19.3863	19.7264	20.0587	20.2709	20.3294	20.3176	20.1520	19.7489	19.3414	19.0213	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	346.7231	379.2027	416.9663	465.1162	481.6351	402.7794	288.0959	294.6138	356.3796	344.9449	329.8290	331.2461	(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	1194.1449	1153.2492	1041.1507	869.7221	670.7606	452.7875	297.7698	312.5028	484.1557	734.1676	984.4699	1194.6630	(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	630.4818	520.1593	464.3932	291.3162	140.7094	0.0000	0.0000	0.0000	0.0000	289.5817	471.3414	642.3822	(98)
Space heating												3450.3652	(98)
Space heating per m2												50.1361	(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	750.5376	590.8488	606.2516	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8021	0.8770	0.8320	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	602.0276	518.1819	504.4126	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	699.0429	662.7223	604.5813	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	69.8510	107.5381	74.5255	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												251.9147	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

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Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	17.4628	26.8845	18.6314	0.0000	0.0000	0.0000 (107)
Space cooling											62.9787 (107)
Space cooling per m2											0.9151 (108)
Energy for space heating											50.1361 (99)
Energy for space cooling											0.9151 (108)
Total											51.0512 (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	68.8200 (1b)	x 2.4000 (2b)	= 165.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1680 (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) =				20.0000 / (5) = 0.1211 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3711 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3154 (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	0.4022	0.3943	0.3864	0.3470	0.3391	0.2997	0.2997	0.2918	0.3154	0.3391	0.3549	0.3706 (22b)
Effective ac	0.5809	0.5777	0.5747	0.5602	0.5575	0.5449	0.5449	0.5426	0.5497	0.5575	0.5630	0.5687 (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)			10.2200	1.3258	13.5492		(27)
WT-E-01	44.3500	10.2200	34.1300	0.1800	6.1434		(29a)
WT-I-01 Common	16.6100	2.0600	14.5500	0.1800	2.6190		(29a)
Flat	68.8200		68.8200	0.1300	8.9466		(30)
Total net area of external elements Aum, m ²			129.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3182		(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)							14.2452 (36)
Total fabric heat loss						(33) + (36) =	47.5634 (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	31.6605	31.4894	31.3216	30.5336	30.3862	29.6998	29.6998	29.5727	29.9642	30.3862	30.6844	30.9962 (38)
Heat transfer coeff	79.2240	79.0528	78.8850	78.0970	77.9496	77.2633	77.2633	77.1362	77.5276	77.9496	78.2479	78.5597 (39)
Average = Sum(39)m / 12 =												78.0963 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1512	1.1487	1.1463	1.1348	1.1327	1.1227	1.1227	1.1208	1.1265	1.1327	1.1370	1.1415 (40)
HLP (average)												1.1348 (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												2.2171 (42)
Average daily hot water use (litres/day)												86.8571 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	95.5428	92.0685	88.5942	85.1199	81.6456	78.1714	78.1714	81.6456	85.1199	88.5942	92.0685	95.5428 (44)
Energy conte	141.6872	123.9205	127.8748	111.4844	106.9719	92.3086	85.5375	98.1556	99.3278	115.7570	126.3579	137.2164 (45)
Energy content (annual)										Total = Sum(45)m =		1366.5997 (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)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.1085	26.3331	27.1734	23.6904	22.7315	19.6156	18.1767	20.8581	21.1072	24.5984	26.8510	29.1585 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570	110.8570 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.3711	16.3171	13.2700	10.0462	7.5097	6.3400	6.8506	8.9046	11.9518	15.1755	17.7121	18.8817 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	194.5275	196.5461	191.4593	180.6302	166.9603	154.1126	145.5295	143.5109	148.5977	159.4269	173.0967	185.9444 (68)
Pumps, fans	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857	34.0857 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856 (71)
Total internal gains	40.4684	39.1862	36.5234	32.9034	30.5531	27.2439	24.4311	28.0350	29.3155	33.0623	37.2931	39.1915 (72)
	309.6242	308.3064	297.5097	279.8368	261.2802	243.9535	233.0683	236.7077	246.1221	263.9218	284.3589	300.2748 (73)

6. Solar gains

[Jan]													Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		W
North					10.2200	10.6334	0.6300		0.7000		0.7700		33.2120 (74)
Solar gains	33.2120	63.4698	107.8506	173.2358	233.3645	249.8236	233.2422	185.0479	129.6714	75.5525	40.9712	27.6871	(83)
Total gains	342.8361	371.7762	405.3604	453.0726	494.6447	493.7771	466.3105	421.7556	375.7935	339.4742	325.3302	327.9619	(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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	60.3247	60.4554	60.5839	61.1952	61.3110	61.8556	61.8556	61.9575	61.6447	61.3110	61.0773	60.8349	60.8349
util living area	5.0216	5.0304	5.0389	5.0797	5.0874	5.1237	5.1237	5.1305	5.1096	5.0874	5.0718	5.0557	5.0557
MIT	0.9992	0.9985	0.9965	0.9874	0.9496	0.8373	0.6833	0.7571	0.9446	0.9930	0.9985	0.9993 (86)	
Th 2	19.6622	19.7694	19.9896	20.3191	20.6506	20.8888	20.9708	20.9513	20.7534	20.3517	19.9565	19.6441 (87)	
util rest of house	19.9593	19.9613	19.9632	19.9725	19.9743	19.9823	19.9823	19.9839	19.9792	19.9743	19.9707	19.9671 (88)	
MIT 2	0.9989	0.9980	0.9952	0.9818	0.9246	0.7575	0.5474	0.6275	0.9055	0.9891	0.9978	0.9991 (89)	
Living area fraction	18.7339	18.8425	19.0638	19.3979	19.7174	19.9250	19.9740	19.9677	19.8209	19.4336	19.0372	18.7220 (90)	
MIT	0.9989	0.9980	0.9952	0.9818	0.9246	0.7575	0.5474	0.6275	0.9055	0.9891	0.9978	0.9991 (89)	
Temperature adjustment	19.0819	19.1900	19.4109	19.7432	20.0673	20.2863	20.3477	20.3364	20.1705	19.7778	19.3818	19.0677 (92)	
adjusted MIT	19.0819	19.1900	19.4109	19.7432	20.0673	20.2863	20.3477	20.3364	20.1705	19.7778	19.3818	19.0677 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9985	0.9975	0.9942	0.9802	0.9273	0.7842	0.5993	0.6768	0.9146	0.9880	0.9973	0.9988 (94)	
Ext temp.	342.3281	370.8441	403.0000	444.0853	458.7018	387.2405	279.4592	285.4575	343.6948	335.4096	324.4438	327.5781 (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	1171.0813	1129.6668	1018.4752	846.8238	652.2241	439.3436	289.5576	303.6401	470.6286	715.4026	961.0264	1167.9981 (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	616.5924	509.9289	457.9136	289.9717	143.9806	0.0000	0.0000	0.0000	0.0000	282.7147	458.3395	625.2725 (98)	
Space heating per m2												3384.7138 (98)	
												(98) / (4) =	49.1821 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (100)	
Useful 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 (101)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (102)	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103a)	
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (104)	
Cooled fraction												221.3928 (104)	
Intermittency factor (Table 10b)												1.0000 (105)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	14.9710	23.7185	16.6587	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												55.3482 (107)
Space cooling per m2												0.8042 (108)
Energy for space heating												49.1821 (99)
Energy for space cooling												0.8042 (108)
Total												49.9864 (109)
Target Fabric Energy Efficiency (TFEE)												57.5 (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	68.8200 (1b)	x 2.4000 (2b)	= 165.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.2600
Number of sides sheltered					0.1630 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1386 (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	0.1455	0.1386	0.1386	0.1282	0.1282	0.1143	0.1178	0.1108	0.1143	0.1212	0.1212	0.1316 (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)			10.2200	1.2357	12.6293		(27)
WT-E-01	44.3500	10.2200	34.1300	0.2000	6.8260		(29a)
WT-I-01 Common	16.6100	2.0600	14.5500	0.2544	3.7020		(29a)
Flat	68.8200		68.8200	0.1500	10.3230		(30)
Total net area of external elements Aum(A, m ²)			129.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5403		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Floor 1			68.8200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6173 (36)
Total fabric heat loss						(33) + (36) =	51.1575 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527 (38)
Heat transfer coeff	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103 (39)
Average = Sum(39)m / 12 =												78.4103 (39)
HLP	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394 (40)
HLP (average)												1.1394 (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												2.2171 (42)
Average daily hot water use (litres/day)												86.8571 (43)
Daily hot water use	95.5428	92.0685	88.5942	85.1199	81.6456	78.1714	78.1714	81.6456	85.1199	88.5942	92.0685	95.5428 (44)
Energy conte	141.6872	123.9205	127.8748	111.4844	106.9719	92.3086	85.5375	98.1556	99.3278	115.7570	126.3579	137.2164 (45)
Energy content (annual)										Total = Sum(45)m =		1366.5997 (45)
Distribution loss (46)m = 0.15 x (45)m	21.2531	18.5881	19.1812	16.7227	16.0458	13.8463	12.8306	14.7233	14.8992	17.3636	18.9537	20.5825 (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	14.0815	12.6991	14.0285	13.5405	13.9662	13.4860	13.9170	13.9489	13.5157	14.0027	13.5920	14.0712	(61)
Total heat required for water heating calculated for each month	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(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	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(64)
RHI water heating demand	50.6313	44.3783	46.0255	40.4537	39.0597	34.0641	31.9205	36.1239	36.4054	41.9899	45.4120	49.1423	(65)
Heat gains from water heating, kWh/month													
	50.6313	44.3783	46.0255	40.4537	39.0597	34.0641	31.9205	36.1239	36.4054	41.9899	45.4120	49.1423	(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	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.9279	40.7927	33.1749	25.1155	18.7741	15.8499	17.1264	22.2615	29.8794	37.9388	44.2801	47.2043	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.3395	293.3523	285.7601	269.5973	249.1945	230.0188	217.2082	214.1954	221.7876	237.9505	258.3533	277.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	(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)	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	(71)
Water heating gains (Table 5)	68.0529	66.0392	61.8622	56.1857	52.4996	47.3113	42.9039	48.5537	50.5631	56.4380	63.0722	66.0514	(72)
Total internal gains	502.1830	498.0470	478.6600	448.7612	418.3310	391.0428	375.1013	382.8734	400.0929	430.1901	463.5684	488.6475	(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

North					10.2200	11.9814		0.4500	0.0000	0.7700		42.4290 (74)

Solar gains	42.4290	73.6115	124.8313	207.5311	271.9742	311.0336	287.4954	233.7568	163.1203	93.9627	53.7603	34.9427 (83)
Total gains	544.6121	571.6585	603.4913	656.2923	690.3052	702.0764	662.5967	616.6302	563.2132	524.1528	517.3287	523.5902 (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	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508		
alpha	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634		
util living area	0.9914	0.9879	0.9749	0.9281	0.7927	0.5451	0.3654	0.4044	0.7350	0.9411	0.9839	0.9928	(86)	
MIT	20.0336	20.1211	20.3464	20.6428	20.8905	20.9872	20.9987	20.9978	20.9442	20.6667	20.3022	20.0061	(87)	
Th 2	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	(88)	
util rest of house	0.9886	0.9839	0.9659	0.9018	0.7249	0.4392	0.2447	0.2755	0.6333	0.9133	0.9774	0.9904	(89)	
MIT 2	19.1109	19.1973	19.4183	19.6985	19.9059	19.9649	19.9687	19.9686	19.9453	19.7261	19.3770	19.0837	(90)	
Living area fraction	19.4569	19.5437	19.7662	20.0525	20.2750	20.3482	20.3548	20.3544	20.3198	20.0787	19.7238	19.4295	(91)	
MIT	19.4569	19.5437	19.7662	20.0525	20.2750	20.3482	20.3548	20.3544	20.3198	20.0787	19.7238	19.4295	(92)	
Temperature adjustment	19.3068	19.3937	19.6162	19.9025	20.1250	20.1982	20.2048	20.2044	20.1698	19.9287	19.5738	19.2795	(93)	
adjusted MIT														

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	537.0839	560.7534	580.5754	590.5087	508.1780	325.3668	180.5392	188.2081	368.8499	478.0048	503.9653	517.4086	(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	1113.9593	1081.5653	957.8788	784.3018	558.6735	329.1816	180.7220	188.5328	389.6797	653.0588	907.5074	1111.8191	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	429.1953	349.9856	280.7137	139.5311	37.5686	0.0000	0.0000	0.0000	0.0000	130.2402	290.5503	442.2414	(98)
Space heating													
RHI space heating demand													

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.8200 (1b)	x 2.4000 (2b)	= 165.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1680 (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					3.2600
Infiltration rate					0.1630 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1386 (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	0.1767	0.1732	0.1697	0.1524	0.1489	0.1316	0.1316	0.1282	0.1386	0.1489	0.1559	0.1628 (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			2.0600	1.0000	2.0600		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
WT-E-01	44.3500	10.2200	34.1300	0.2000	6.8260		(29a)
WT-I-01 Common	16.6100	2.0600	14.5500	0.2544	3.7020		(29a)
Flat	68.8200		68.8200	0.1500	10.3230		(30)
Total net area of external elements Aum(A, m2)			129.7800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.5403	(33)
Party Wall 1					16.3200	0.0000	(32)
Party Floor 1					68.8200		(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6173 (36)
Total fabric heat loss						(33) + (36) =	51.1575 (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	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527	27.2527 (38)
Heat transfer coeff	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103	78.4103 (39)
Average = Sum(39)m / 12 =												78.4103 (39)
HLP	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394	1.1394 (40)
HLP (average)												1.1394 (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												2.2171 (42)
Average daily hot water use (litres/day)												86.8571 (43)
Daily hot water use	95.5428	92.0685	88.5942	85.1199	81.6456	78.1714	78.1714	81.6456	85.1199	88.5942	92.0685	95.5428 (44)
Energy conte	141.6872	123.9205	127.8748	111.4844	106.9719	92.3086	85.5375	98.1556	99.3278	115.7570	126.3579	137.2164 (45)
Energy content (annual)												Total = Sum(45)m = 1366.5997 (45)
Distribution loss (46)m = 0.15 x (45)m	21.2531	18.5881	19.1812	16.7227	16.0458	13.8463	12.8306	14.7233	14.8992	17.3636	18.9537	20.5825 (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	14.0815	12.6991	14.0285	13.5405	13.9662	13.4860	13.9170	13.9489	13.5157	14.0027	13.5920	14.0712	(61)
Total heat required for water heating calculated for each month	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(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	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(64)
Heat gains from water heating, kWh/month	50.6313	44.3783	46.0255	40.4537	39.0597	34.0641	31.9205	36.1239	36.4054	41.9899	45.4120	49.1423	(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	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.9279	40.7927	33.1749	25.1155	18.7741	15.8499	17.1264	22.2615	29.8794	37.9388	44.2801	47.2043	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.3395	293.3523	285.7601	269.5973	249.1945	230.0188	217.2082	214.1954	221.7876	237.9505	258.3533	277.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	(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)	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	(71)
Water heating gains (Table 5)	68.0529	66.0392	61.8622	56.1857	52.4996	47.3113	42.9039	48.5537	50.5631	56.4380	63.0722	66.0514	(72)
Total internal gains	502.1830	498.0470	478.6600	448.7612	418.3310	391.0428	375.1013	382.8734	400.0929	430.1901	463.5684	488.6475	(73)

6. Solar gains

[Jan]													Gains
	Area				Solar flux		g		FF		Access		W
	m2				Table 6a		Specific data		Specific data		factor		
					W/m2		or Table 6b		or Table 6c		Table 6d		
-----	-----												
North	10.2200				10.6334		0.4500		0.0000		0.7700		37.6553 (74)

Solar gains	37.6553	71.9612	122.2796	196.4125	264.5855	283.2467	264.4470	209.8049	147.0197	85.6604	46.4526	31.3913	(83)
Total gains	539.8383	570.0082	600.9396	645.1737	682.9166	674.2894	639.5483	592.6784	547.1126	515.8504	510.0210	520.0388	(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	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508		
alpha	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634		
util living area	0.9934	0.9901	0.9809	0.9497	0.8612	0.6930	0.5283	0.5883	0.8304	0.9614	0.9885	0.9945	(86)	
MIT	19.9428	20.0456	20.2514	20.5406	20.8071	20.9528	20.9902	20.9836	20.8814	20.5631	20.1991	19.9060	(87)	
Th 2	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	(88)	
util rest of house	0.9912	0.9869	0.9744	0.9315	0.8127	0.6014	0.4103	0.4665	0.7555	0.9437	0.9841	0.9927	(89)	
MIT 2	19.0206	19.1225	19.3254	19.6038	19.8411	19.9477	19.9664	19.9643	19.9048	19.6300	19.2754	18.9841	(90)	
Living area fraction									fLA = Living area / (4) =			0.3749	(91)	
MIT	19.3663	19.4685	19.6726	19.9550	20.2033	20.3245	20.3502	20.3464	20.2709	19.9798	19.6217	19.3297	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.2163	19.3185	19.5226	19.8050	20.0533	20.1745	20.2002	20.1964	20.1209	19.8298	19.4717	19.1797	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	533.9867	561.0510	583.3523	598.7047	558.0503	418.6440	279.7682	293.0719	420.1959	485.2404	500.4993	515.3229	(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	1169.5924	1130.5611	1021.1029	855.0643	654.9818	437.0985	282.2945	297.6760	472.1005	723.7122	970.0685	1174.5641	(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	472.8907	382.7108	325.6865	184.5789	72.1170	0.0000	0.0000	0.0000	0.0000	177.4230	338.0898	490.4755	(98)	
Space heating												2443.9722	(98)	
Space heating per m2										(98) / (4) =		35.5125	(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													2700.5218 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.8907	382.7108	325.6865	184.5789	72.1170	0.0000	0.0000	0.0000	0.0000	177.4230	338.0898	490.4755	(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)	522.5312	422.8848	359.8746	203.9546	79.6873	0.0000	0.0000	0.0000	0.0000	196.0475	373.5799	541.9619	(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	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(64)
Efficiency of water heater (217)m	89.6854	89.6357	89.5043	89.1799	88.4685	87.3000	87.3000	87.3000	87.3000	89.1201	89.5391	87.3000	(216)
Fuel for water heating, kWh/month	173.6833	152.4166	158.5435	140.1940	136.7018	121.1851	113.9228	128.4129	129.2595	145.6010	156.3002	168.6132	(219)
Water heating fuel used												1724.8338	(219)
Annual totals kWh/year													
Space heating fuel - main system												2700.5218	(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)													37.0769 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													112.0769 (231)
Electricity for lighting (calculated in Appendix L)													324.4402 (232)
Total delivered energy for all uses													4861.8727 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2700.5218	3.4800	93.9782 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1724.8338	3.4800	60.0242 (247)
Mechanical ventilation fans	37.0769	13.1900	4.8904 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	324.4402	13.1900	42.7937 (250)
Additional standing charges			120.0000 (251)
Total energy cost			331.5790 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	1.2235 (257)
SAP value	82.9316
SAP rating (Section 12)	83 (258)
SAP band	B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2700.5218	0.2160	583.3127 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1724.8338	0.2160	372.5641 (264)
Space and water heating			955.8768 (265)
Pumps and fans	112.0769	0.5190	58.1679 (267)
Energy for lighting	324.4402	0.5190	168.3845 (268)
Total kg/year			1182.4292 (272)
CO2 emissions per m2			17.1800 (273)
EI value			86.0793
EI rating			86 (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	$3.48 / 0.8867 = 3.925$, stars = 4
Water heating environmental impact	$0.216 / 0.8867 = 0.2436$, stars = 4

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

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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	68.8200 (1b)	x 2.4000 (2b)	= 165.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1680 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50								3.2600				
Infiltration rate								0.1630	(18)			
Number of sides sheltered								2	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1386	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	0.1455	0.1386	0.1386	0.1282	0.1282	0.1143	0.1178	0.1108	0.1143	0.1212	0.1212	0.1316 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross 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)			10.2200	1.2357	12.6293		(27)
WT-E-01	44.3500	10.2200	34.1300	0.2000	6.8260		(29a)
WT-I-01 Common	16.6100	2.0600	14.5500	0.2544	3.7020		(29a)
Flat	68.8200		68.8200	0.1500	10.3230		(30)
Total net area of external elements Aum(A, m ²)			129.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	35.5403		(33)
Party Wall 1			16.3200	0.0000	0.0000		(32)
Party Floor 1			68.8200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.6173 (36)
Total fabric heat loss						(33) + (36) =	51.1575 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2171 (42)
Average daily hot water use (litres/day)												86.8571 (43)
Daily hot water use	Jan 95.5428	Feb 92.0685	Mar 88.5942	Apr 85.1199	May 81.6456	Jun 78.1714	Jul 78.1714	Aug 81.6456	Sep 85.1199	Oct 88.5942	Nov 92.0685	Dec 95.5428 (44)
Energy conte	141.6872	123.9205	127.8748	111.4844	106.9719	92.3086	85.5375	98.1556	99.3278	115.7570	126.3579	137.2164 (45)
Energy content (annual)												Total = Sum(45)m = 1366.5997 (45)
Distribution loss (46)m = 0.15 x (45)m	21.2531	18.5881	19.1812	16.7227	16.0458	13.8463	12.8306	14.7233	14.8992	17.3636	18.9537	20.5825 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0815	12.6991	14.0285	13.5405	13.9662	13.4860	13.9170	13.9489	13.5157	14.0027	13.5920	14.0712	(61)
Total heat required for water heating calculated for each month	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(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	155.7686	136.6196	141.9033	125.0249	120.9381	105.7946	99.4546	112.1045	112.8436	129.7597	139.9499	151.2876	(64)
Heat gains from water heating, kWh/month	50.6313	44.3783	46.0255	40.4537	39.0597	34.0641	31.9205	36.1239	36.4054	41.9899	45.4120	49.1423	(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	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	133.0284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.9279	40.7927	33.1749	25.1155	18.7741	15.8499	17.1264	22.2615	29.8794	37.9388	44.2801	47.2043	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.3395	293.3523	285.7601	269.5973	249.1945	230.0188	217.2082	214.1954	221.7876	237.9505	258.3533	277.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	50.5200	(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)	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	-88.6856	(71)
Water heating gains (Table 5)	68.0529	66.0392	61.8622	56.1857	52.4996	47.3113	42.9039	48.5537	50.5631	56.4380	63.0722	66.0514	(72)
Total internal gains	502.1830	498.0470	478.6600	448.7612	418.3310	391.0428	375.1013	382.8734	400.0929	430.1901	463.5684	488.6475	(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	

North			10.2200		11.9814		0.4500		0.0000		0.7700		42.4290 (74)	

Solar gains			42.4290	73.6115	124.8313	207.5311	271.9742	311.0336	287.4954	233.7568	163.1203	93.9627	53.7603	34.9427 (83)
Total gains			544.6121	571.6585	603.4913	656.2923	690.3052	702.0764	662.5967	616.6302	563.2132	524.1528	517.3287	523.5902 (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	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508	60.9508		
alpha	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634	5.0634		
util living area	0.9914	0.9879	0.9749	0.9281	0.7927	0.5451	0.3654	0.4044	0.7350	0.9411	0.9839	0.9928	(86)	
MIT	20.0336	20.1211	20.3464	20.6428	20.8905	20.9872	20.9987	20.9978	20.9442	20.6667	20.3022	20.0061	(87)	
Th 2	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	19.9688	(88)	
util rest of house	0.9886	0.9839	0.9659	0.9018	0.7249	0.4392	0.2447	0.2755	0.6333	0.9133	0.9774	0.9904	(89)	
MIT 2	19.1109	19.1973	19.4183	19.6985	19.9059	19.9649	19.9687	19.9686	19.9453	19.7261	19.3770	19.0837	(90)	
Living area fraction									fLA = Living area / (4) =			0.3749	(91)	
MIT	19.4568	19.5437	19.7662	20.0525	20.2750	20.3482	20.3548	20.3544	20.3198	20.0787	19.7238	19.4295	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.3068	19.3937	19.6162	19.9025	20.1250	20.1982	20.2048	20.2044	20.1698	19.9287	19.5738	19.2795	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	537.0839	560.7534	580.5754	590.5087	508.1780	325.3668	180.5392	188.2081	368.8499	478.0048	503.9653	517.4086	(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	1113.9593	1081.5653	957.8788	784.3018	558.6735	329.1816	180.7220	188.5328	389.6797	653.0588	907.5074	1111.8191	(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	429.1953	349.9856	280.7137	139.5311	37.5686	0.0000	0.0000	0.0000	0.0000	130.2402	290.5503	442.2414	(98)	
Space heating												2100.0262	(98)	
Space heating per m2												30.5148	(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	2320.4709	(211)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Space heating requirement	429.1953 349.9856 280.7137 139.5311 37.5686 0.0000 0.0000 0.0000 0.0000 130.2402 290.5503 442.2414	(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)	474.2490 386.7245 310.1809 154.1780 41.5123 0.0000 0.0000 0.0000 0.0000 143.9118 321.0500 488.6645	(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	155.7686 136.6196 141.9033 125.0249 120.9381 105.7946 99.4546 112.1045 112.8436 129.7597 139.9499 151.2876	(64)
Efficiency of water heater (217)m	89.6252 89.5781 89.3997 88.9590 88.0378 87.3000 87.3000 87.3000 87.3000 88.8742 89.4343 87.3000	(216)
Fuel for water heating, kWh/month	173.8000 152.5145 158.7291 140.5422 137.3706 121.1851 113.9228 128.4129 129.2595 146.0039 156.4834 168.7306	(219)
Water heating fuel used		1726.9546 (219)
Annual totals kWh/year		
Space heating fuel - main system		2320.4709 (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)		37.0769 (230a)
central heating pump		30.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		112.0769 (231)
Electricity for lighting (calculated in Appendix L)		324.4402 (232)
Total delivered energy for all uses		4483.9426 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2320.4709	3.8700	89.8022 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1726.9546	3.8700	66.8331 (247)
Mechanical ventilation fans	37.0769	18.9000	7.0075 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	324.4402	18.9000	61.3192 (250)
Additional standing charges			93.0000 (251)
Total energy cost			332.1371 (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	2320.4709	0.2160	501.2217 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1726.9546	0.2160	373.0222 (264)
Space and water heating			874.2439 (265)
Pumps and fans	112.0769	0.5190	58.1679 (267)
Energy for lighting	324.4402	0.5190	168.3845 (268)
Total kg/year			1100.7963 (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	2320.4709	1.2200	2830.9745 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1726.9546	1.2200	2106.8846 (264)
Space and water heating			4937.8591 (265)
Pumps and fans	112.0769	3.0700	344.0761 (267)
Energy for lighting	324.4402	3.0700	996.0315 (268)
Primary energy kWh/year			6277.9667 (272)
Primary energy kWh/m2/year			91.2230 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 86

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

(For testing purposes):

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

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

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 86

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	£83	£83	£0
Mains gas	£250	£250	£0
Space heating	£204	£204	£0
Water heating	£67	£67	£0
Lighting	£61	£61	£0
Total cost of fuels	£333	£333	£0
Total cost of uses	£332	£332	£0
Delivered energy	65 kWh/m²	65 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	91 kWh/m²	91 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	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	163.52 (P1)
Transmission heat loss coefficient	51.16 (37)
Summer heat loss coefficient	214.67 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
North	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
North	10.2200	81.1852	0.4500 0.0000
total:			0.9000 336.0336

Solar gains	Jun	Jul	Aug	(P4)
Internal gains	364	336	273	
Total summer gains	388	372	380	(P5)
	752	708	653	
Summer gain/loss ratio	3.50	3.30	3.04	(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	19.75	21.45	21.09	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			