

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026u_145_As_Built				Issued on Date	07/07/2021
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	83 B	DER	18.18	TER	20.06	
Environmental	86 B	% DER<TER	9.38			
CO ₂ Emissions (t/year)	1.25	DFEE	50.48	TFEE	60.97	
General Requirements Compliance	Pass	% DFEE<TFEE	17.20			
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 80 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) 20.06 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.18 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)50.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (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	1.27 (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: 9.75 m², No overhang
Windows facing West: 10.48 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.3 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6600 (1b)	x 2.4000 (2b)	= 191.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.1840 (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							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1508	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
Mechanical extract ventilation - decentralised	0.1922	0.1885	0.1847	0.1659	0.1621	0.1432	0.1432	0.1395	0.1508	0.1621	0.1696	0.1772
If mechanical ventilation:												0.5000
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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			20.2300	1.2357	24.9990		(27)
WT-E-03	60.4300	20.2300	40.2000	0.1600	6.4320		(29a)
WT-I-02	3.1200	2.1200	1.0000	0.1584	0.1584		(29a)
Flat Roof	79.6600		79.6600	0.1500	11.9490		(30)
Total net area of external elements Aum(A, m2)			143.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	45.6585		(33)
Party Wall 1			40.0800	0.0000	0.0000		(32)
Party Floor 1			79.6600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9222 (36)
Total fabric heat loss						(33) + (36) =	67.5807 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4564 (42)
Average daily hot water use (litres/day)													92.5390 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
Energy conte	101.7929	98.0913	94.3898	90.6882	86.9866	83.2851	83.2851	86.9866	90.6882	94.3898	98.0913	101.7929	(44)
Energy content (annual)	150.9559	132.0270	136.2400	118.7774	113.9697	98.3472	91.1331	104.5766	105.8256	123.3295	134.6238	146.1927	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =	1455.9986	(45)	
	22.6434	19.8040	20.4360	17.8166	17.0955	14.7521	13.6700	15.6865	15.8738	18.4994	20.1936	21.9289	(46)

Southern Energy
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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	14.1189	12.7361	14.0652	13.5713	13.9945	13.5094	13.9387	13.9749	13.5431	14.0359	13.6297	14.1074 (61)
Total heat required for water heating calculated for each month												
	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
							Solar input (sum of months) = Sum(63)m = 0.0000 (63)					
Output from w/h	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002 (64)
							Total per year (kWh/year) = Sum(64)m = 1621.2237 (64)					
Heat gains from water heating, kWh/month												
	53.7226	47.0830	48.8161	42.8863	41.3936	36.0778	33.7864	38.2654	38.5728	44.5160	48.1698	52.1359 (65)

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													3770.3056 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	650.2737	515.3493	433.3959	257.4352	127.9900	0.0000	0.0000	0.0000	0.0000	276.2785	480.7187	670.6852	(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)	718.5345	569.4467	478.8905	284.4588	141.4254	0.0000	0.0000	0.0000	0.0000	305.2801	531.1809	741.0886	(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	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(64)
Efficiency of water heater (217)m	89.8333	89.7783	89.6538	89.3875	88.8714	87.3000	87.3000	87.3000	87.3000	89.4116	89.7248	89.8646	(216)
Fuel for water heating, kWh/month	183.7567	161.2451	167.6508	148.0618	143.9881	128.1290	120.3572	135.7978	136.7339	153.6327	165.2314	178.3797	(219)
Water heating fuel used												1822.9641	(219)
Annual totals kWh/year													
Space heating fuel - main system												3770.3056	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.2560, total flow = 34.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													42.9170 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													117.9170 (231)
Electricity for lighting (calculated in Appendix L)													344.3726 (232)
Total delivered energy for all uses													6055.5593 (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	3770.3056	0.2160	814.3860 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1822.9641	0.2160	393.7602 (264)
Space and water heating			1208.1463 (265)
Pumps and fans	117.9170	0.5190	61.1989 (267)
Energy for lighting	344.3726	0.5190	178.7294 (268)
Total CO2, kg/year			1448.0746 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.1800 (273)

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

DER			18.1800 ZC1
Total Floor Area		TFA	79.6600
Assumed number of occupants		N	2.4564
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.2709 ZC2
CO2 emissions from cooking, equation (L16)			2.2339 ZC3
Total CO2 emissions			36.6848 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			36.6848 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	79.6600 (1b)	x 2.4000 (2b)	= 191.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1569 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4069 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3764 (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	0.4799	0.4705	0.4611	0.4140	0.4046	0.3576	0.3576	0.3482	0.3764	0.4046	0.4234	0.4423 (22b)
	0.6152	0.6107	0.6063	0.5857	0.5819	0.5639	0.5639	0.5606	0.5708	0.5819	0.5897	0.5978 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			17.7900	1.3258	23.5852		(27)
WT-E-03	60.4300	17.7900	42.6400	0.1800	7.6752		(29a)
WT-I-02	3.1200	2.1200	1.0000	0.1800	0.1800		(29a)
Flat Roof	79.6600		79.6600	0.1300	10.3558		(30)
Total net area of external elements Aum(A, m ²)			143.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9162		(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)							19.2121 (36)
Total fabric heat loss						(33) + (36) =	63.1283 (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	38.8106	38.5285	38.2520	36.9531	36.7101	35.5788	35.5788	35.3693	36.0146	36.7101	37.2017	37.7157 (38)
Heat transfer coeff	101.9389	101.6568	101.3803	100.0814	99.8384	98.7071	98.7071	98.4977	99.1429	99.8384	100.3300	100.8440 (39)
Average = Sum(39)m / 12 =												100.0803 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2797	1.2761	1.2727	1.2564	1.2533	1.2391	1.2391	1.2365	1.2446	1.2533	1.2595	1.2659 (40)
HLP (average)												1.2563 (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												2.4564 (42)
Average daily hot water use (litres/day)												92.5390 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.7929	98.0913	94.3898	90.6882	86.9866	83.2851	83.2851	86.9866	90.6882	94.3898	98.0913	101.7929 (44)
Energy conte	150.9559	132.0270	136.2400	118.7774	113.9697	98.3472	91.1331	104.5766	105.8256	123.3295	134.6238	146.1927 (45)
Energy content (annual)										Total = Sum(45)m =		1455.9986 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6434	19.8040	20.4360	17.8166	17.0955	14.7521	13.6700	15.6865	15.8738	18.4994	20.1936	21.9289 (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	50.9589	45.1489	48.1000	44.7230	44.3274	41.0721	42.4412	44.3274	44.7230	48.1000	48.3738	50.9589 (61)
Total heat required for water heating calculated for each month	201.9148	177.1759	184.3400	163.5003	158.2972	139.4193	133.5743	148.9040	150.5485	171.4295	182.9976	197.1516 (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	201.9148	177.1759	184.3400	163.5003	158.2972	139.4193	133.5743	148.9040	150.5485	171.4295	182.9976	197.1516 (64)
Heat gains from water heating, kWh/month	62.9326	55.1862	57.3248	50.6742	48.9768	42.9685	40.9121	45.8536	46.3677	53.0321	56.8559	61.3488 (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	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4992	17.3190	14.0848	10.6631	7.9708	6.7293	7.2712	9.4514	12.6856	16.1073	18.7996	20.0411 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.7285	220.9982	215.2786	203.1022	187.7317	173.2856	163.6347	161.3650	167.0846	179.2610	194.6315	209.0776 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819 (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)	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551 (71)
Water heating gains (Table 5)	84.5868	82.1223	77.0495	70.3808	65.8290	59.6784	54.9893	61.6312	64.3996	71.2796	78.9665	82.4581 (72)
Total internal gains	385.6601	383.2852	369.2585	346.9918	324.3772	302.5390	288.7409	295.2932	307.0156	329.4937	355.2433	374.4225 (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				8.5700	10.6334	0.6300		0.7000		0.7700		27.8500 (74)
West				9.2200	19.6403	0.6300		0.7000		0.7700		55.3414 (80)
Solar gains	83.1913	161.4822	268.7263	405.2896	514.3554	535.7026	506.1534	421.9453	316.0925	191.8137	103.3607	68.7272 (83)
Total gains	468.8515	544.7674	637.9848	752.2814	838.7326	838.2416	794.8943	717.2386	623.1081	521.3073	458.6040	443.1496 (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	54.2672	54.4178	54.5663	55.2744	55.4090	56.0440	56.0440	56.1632	55.7977	55.4090	55.1375	54.8565
alpha	4.6178	4.6279	4.6378	4.6850	4.6939	4.7363	4.7363	4.7442	4.7198	4.6939	4.6758	4.6571
util living area	0.9981	0.9959	0.9881	0.9564	0.8635	0.6930	0.5318	0.6034	0.8613	0.9800	0.9963	0.9986 (86)
MIT	19.5783	19.7390	20.0318	20.4315	20.7637	20.9411	20.9865	20.9764	20.8292	20.3896	19.9161	19.5549 (87)
Th 2	19.8568	19.8596	19.8623	19.8752	19.8776	19.8888	19.8888	19.8909	19.8845	19.8776	19.8727	19.8676 (88)
util rest of house	0.9975	0.9944	0.9837	0.9395	0.8131	0.5961	0.4049	0.4717	0.7893	0.9694	0.9947	0.9981 (89)
MIT 2	17.9705	18.2070	18.6342	19.2117	19.6497	19.8508	19.8841	19.8815	19.7458	19.1642	18.4755	17.9437 (90)
Living area fraction									fLA = Living area / (4) =			0.3728 (91)
MIT	18.5699	18.7782	19.1553	19.6665	20.0650	20.2573	20.2951	20.2897	20.1498	19.6211	19.0126	18.5444 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5699	18.7782	19.1553	19.6665	20.0650	20.2573	20.2951	20.2897	20.1498	19.6211	19.0126	18.5444 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9925	0.9799	0.9356	0.8226	0.6302	0.4526	0.5211	0.8091	0.9661	0.9930	0.9972 (94)
Useful gains	467.1449	540.6574	625.1753	703.8187	689.9455	528.2582	359.7488	373.7597	504.1387	503.6599	455.3831	441.9037 (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	1454.6620	1410.8144	1282.9936	1077.5266	835.1489	558.4156	364.7363	383.1274	599.7897	900.6523	1195.1912	1446.5471 (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	734.7127	584.7455	489.4168	269.0697	108.0314	0.0000	0.0000	0.0000	0.0000	295.3624	532.6619	747.4547 (98)
Space heating												3761.4549 (98)
Space heating per m2										(98) / (4) =		47.2189 (99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													4027.2536 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	734.7127	584.7455	489.4168	269.0697	108.0314	0.0000	0.0000	0.0000	0.0000	295.3624	532.6619	747.4547	(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)	786.6303	626.0658	524.0008	288.0832	115.6653	0.0000	0.0000	0.0000	0.0000	316.2338	570.3018	800.2727	(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	201.9148	177.1759	184.3400	163.5003	158.2972	139.4193	133.5743	148.9040	150.5485	171.4295	182.9976	197.1516	(64)
Efficiency of water heater	88.0135	87.8311	87.3926	86.2973	84.1119	80.3000	80.3000	80.3000	80.3000	86.4086	87.5831	88.0876	(216)
(217)m	88.0135	87.8311	87.3926	86.2973	84.1119	80.3000	80.3000	80.3000	80.3000	86.4086	87.5831	88.0876	(217)
Fuel for water heating, kWh/month	229.4134	201.7234	210.9333	189.4616	188.1983	173.6230	166.3441	185.4347	187.4826	198.3940	208.9416	223.8133	(219)
Water heating fuel used												2363.7632	(219)
Annual totals kWh/year													
Space heating fuel - main system												4027.2536	(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)												344.3618	(232)
Total delivered energy for all uses												6810.3786	(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	4027.2536	0.2160	869.8868 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2363.7632	0.2160	510.5729 (264)
Space and water heating			1380.4596 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	344.3618	0.5190	178.7238 (268)
Total CO2, kg/m2/year			1598.1084 (272)
Emissions per m2 for space and water heating			17.3294 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2436 (272b)
Emissions per m2 for pumps and fans			0.4886 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.3294 * 1.00) + 2.2436 + 0.4886, rounded to 2 d.p.			20.0600 (273)

FULL SAP CALCULATION PRINTOUT

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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	79.6600 (1b)	x 2.4000 (2b)	= 191.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					3.2600
Number of sides sheltered					0.3199 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2959 (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	0.3773	0.3699	0.3625	0.3255	0.3181	0.2811	0.2811	0.2737	0.2959	0.3181	0.3329	0.3477 (22b)
	0.5712	0.5684	0.5657	0.5530	0.5506	0.5395	0.5395	0.5375	0.5438	0.5506	0.5554	0.5605 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			20.2300	1.2357	24.9990		(27)
WT-E-03	60.4300	20.2300	40.2000	0.1600	6.4320		(29a)
WT-I-02	3.1200	2.1200	1.0000	0.1584	0.1584		(29a)
Flat Roof	79.6600		79.6600	0.1500	11.9490		(30)
Total net area of external elements Aum, m ²			143.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.6585		(33)
Party Wall 1			40.0800	0.0000	0.0000		(32)
Party Floor 1			79.6600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9222 (36)
Total fabric heat loss						(33) + (36) =	67.5807 (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	36.0361	35.8617	35.6908	34.8879	34.7377	34.0385	34.0385	33.9090	34.3078	34.7377	35.0416	35.3593 (38)
Heat transfer coeff	103.6167	103.4423	103.2714	102.4686	102.3184	101.6191	101.6191	101.4896	101.8885	102.3184	102.6222	102.9399 (39)
Average = Sum(39)m / 12 =												102.4679 (39)
HLP	1.3007	1.2985	1.2964	1.2863	1.2844	1.2757	1.2757	1.2740	1.2790	1.2844	1.2883	1.2922 (40)
HLP (average)												1.2863 (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												2.4564 (42)
Average daily hot water use (litres/day)												92.5390 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	101.7929	98.0913	94.3898	90.6882	86.9866	83.2851	83.2851	86.9866	90.6882	94.3898	98.0913	101.7929 (44)
Energy content (annual)	150.9559	132.0270	136.2400	118.7774	113.9697	98.3472	91.1331	104.5766	105.8256	123.3295	134.6238	146.1927 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1455.9986 (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	32.0781	28.0557	28.9510	25.2402	24.2186	20.8988	19.3658	22.2225	22.4879	26.2075	28.6076	31.0660 (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	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4998	17.3196	14.0852	10.6634	7.9710	6.7295	7.2714	9.4517	12.6860	16.1078	18.8002	20.0418	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.7285	220.9982	215.2786	203.1022	187.7317	173.2856	163.6347	161.3650	167.0846	179.2610	194.6315	209.0776	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	(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)	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	(71)
Water heating gains (Table 5)	43.1158	41.7496	38.9126	35.0558	32.5518	29.0261	26.0293	29.8690	31.2332	35.2252	39.7327	41.7553	(72)
Total internal gains	341.1897	339.9130	328.1221	308.6671	288.1002	268.8868	256.7811	260.5314	270.8496	290.4397	313.0101	330.7204	(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				9.7500	10.6334	0.4500	0.0000		0.7700		35.9236 (74)	
West				10.4800	19.6403	0.4500	0.0000		0.7700		71.3201 (80)	
Solar gains	107.2437	208.1690	346.4212	522.4783	663.0935	690.6204	652.5232	543.9547	407.4847	247.2699	133.2441	88.5978 (83)
Total gains	448.4334	548.0821	674.5433	831.1454	951.1938	959.5073	909.3044	804.4860	678.3343	537.7096	446.2542	419.3182 (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	21.3554	21.3914	21.4268	21.5947	21.6264	21.7752	21.7752	21.8030	21.7176	21.6264	21.5624	21.4958	
alpha	2.4237	2.4261	2.4285	2.4396	2.4418	2.4517	2.4517	2.4535	2.4478	2.4418	2.4375	2.4331	
util living area	0.9716	0.9537	0.9153	0.8337	0.7096	0.5639	0.4437	0.5047	0.7225	0.8967	0.9588	0.9757	(86)
MIT	18.2405	18.5627	19.1215	19.8288	20.4073	20.7651	20.9062	20.8692	20.5429	19.7529	18.8628	18.1781	(87)
Th 2	19.8403	19.8420	19.8437	19.8516	19.8530	19.8599	19.8599	19.8612	19.8573	19.8530	19.8500	19.8469	(88)
util rest of house	0.9670	0.9463	0.9014	0.8064	0.6616	0.4893	0.3442	0.4025	0.6568	0.8734	0.9509	0.9717	(89)
MIT 2	17.3325	17.6514	18.2002	18.8836	19.4140	19.7202	19.8207	19.8021	19.5545	18.8306	17.9579	17.2751	(90)
Living area fraction									fLA = Living area / (4) =			0.3728	(91)
MIT	17.6710	17.9912	18.5437	19.2360	19.7843	20.1097	20.2254	20.2000	19.9230	19.1745	18.2953	17.6118	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6710	17.9912	18.5437	19.2360	19.7843	20.1097	20.2254	20.2000	19.9230	19.1745	18.2953	17.6118	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9551	0.9305	0.8819	0.7893	0.6584	0.5067	0.3776	0.4348	0.6611	0.8562	0.9365	0.9610	(94)
Ext temp.	428.3088	510.0148	594.9073	656.0344	626.3007	486.1569	343.3838	349.7671	448.4199	460.3865	417.9317	402.9696	(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	1385.4591	1354.1813	1243.7687	1059.1160	827.1722	559.8946	368.4098	385.6567	593.2966	877.3264	1148.8841	1380.6071	(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	712.1198	567.2798	482.7529	290.2187	149.4484	0.0000	0.0000	0.0000	0.0000	310.2033	526.2857	727.3623	(98)
Space heating per m2												3765.6710	(98)
												47.2718	(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	955.2199	751.9816	771.3213	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7893	0.8417	0.8049	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	754.0027	632.9748	620.8045	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1213.0259	1152.4505	1031.4549	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	330.4967	386.4899	305.5238	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												1022.5105	(104)

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Cooled Fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	82.6242	96.6225	76.3810	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												255.6276 (107)
Space cooling per m2												3.2090 (108)
Energy for space heating												47.2718 (99)
Energy for space cooling												3.2090 (108)
Total												50.4808 (109)
Dwelling Fabric Energy Efficiency (DFEE)												50.5 (109)

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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	79.6600 (1b)	x 2.4000 (2b)	= 191.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1569 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4069 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3764 (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												
	0.4799	0.4705	0.4611	0.4140	0.4046	0.3576	0.3576	0.3482	0.3764	0.4046	0.4234	0.4423 (22b)
Effective ac	0.6152	0.6107	0.6063	0.5857	0.5819	0.5639	0.5639	0.5606	0.5708	0.5819	0.5897	0.5978 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			17.7900	1.3258	23.5852		(27)
WT-E-03	60.4300	17.7900	42.6400	0.1800	7.6752		(29a)
WT-I-02	3.1200	2.1200	1.0000	0.1800	0.1800		(29a)
Flat Roof	79.6600		79.6600	0.1300	10.3558		(30)
Total net area of external elements Aum(A, m ²)			143.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9162		(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)							19.2121 (36)
Total fabric heat loss						(33) + (36) =	63.1283 (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	38.8106	38.5285	38.2520	36.9531	36.7101	35.5788	35.5788	35.3693	36.0146	36.7101	37.2017	37.7157 (38)
Heat transfer coeff	101.9389	101.6568	101.3803	100.0814	99.8384	98.7071	98.7071	98.4977	99.1429	99.8384	100.3300	100.8440 (39)
Average = Sum(39)m / 12 =												100.0803 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2797	1.2761	1.2727	1.2564	1.2533	1.2391	1.2391	1.2365	1.2446	1.2533	1.2595	1.2659 (40)
HLP (average)												1.2563 (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												2.4564 (42)
Average daily hot water use (litres/day)												92.5390 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.7929	98.0913	94.3898	90.6882	86.9866	83.2851	83.2851	86.9866	90.6882	94.3898	98.0913	101.7929 (44)
Energy conte	150.9559	132.0270	136.2400	118.7774	113.9697	98.3472	91.1331	104.5766	105.8256	123.3295	134.6238	146.1927 (45)
Energy content (annual)										Total = Sum(45)m =		1455.9986 (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	(59)
Heat gains from water heating, kWh/month	32.0781	28.0557	28.9510	25.2402	24.2186	20.8988	19.3658	22.2225	22.4879	26.2075	28.6076	31.0660 (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	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189	122.8189 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4992	17.3190	14.0848	10.6631	7.9708	6.7293	7.2712	9.4514	12.6856	16.1073	18.7996	20.0411 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.7285	220.9982	215.2786	203.1022	187.7317	173.2856	163.6347	161.3650	167.0846	179.2610	194.6315	209.0776 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819	35.2819 (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)	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551 (71)
Water heating gains (Table 5)	43.1158	41.7496	38.9126	35.0558	32.5518	29.0261	26.0293	29.8690	31.2332	35.2252	39.7327	41.7553 (72)
Total internal gains	341.1891	339.9125	328.1217	308.6668	288.1000	268.8866	256.7809	260.5311	270.8492	290.4392	313.0095	330.7197 (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	8.5700	10.6334	0.6300	0.7000	0.7700	27.8500 (74)						
West	9.2200	19.6403	0.6300	0.7000	0.7700	55.3414 (80)						
Solar gains	83.1913	161.4822	268.7263	405.2896	514.3554	535.7026	506.1534	421.9453	316.0925	191.8137	103.3607	68.7272 (83)
Total gains	424.3805	501.3947	596.8480	713.9563	802.4554	804.5892	762.9343	682.4764	586.9417	482.2528	416.3702	399.4469 (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	54.2672	54.4178	54.5663	55.2744	55.4090	56.0440	56.0440	56.1632	55.7977	55.4090	55.1375	54.8565
alpha	4.6178	4.6279	4.6378	4.6850	4.6939	4.7363	4.7363	4.7442	4.7198	4.6939	4.6758	4.6571
util living area	0.9988	0.9971	0.9909	0.9637	0.8787	0.7136	0.5516	0.6286	0.8819	0.9852	0.9975	0.9991 (86)
MIT	19.5275	19.6899	19.9868	20.3952	20.7415	20.9333	20.9843	20.9720	20.8071	20.3483	19.8681	19.5047 (87)
Th 2	19.8568	19.8596	19.8623	19.8752	19.8776	19.8888	19.8888	19.8909	19.8845	19.8776	19.8727	19.8676 (88)
util rest of house	0.9983	0.9960	0.9874	0.9491	0.8314	0.6168	0.4212	0.4940	0.8155	0.9770	0.9965	0.9988 (89)
MIT 2	18.5183	18.6825	18.9797	19.3885	19.7049	19.8589	19.8850	19.8831	19.7746	19.3510	18.8710	18.5040 (90)
Living area fraction									fLA = Living area / (4) =			0.3728 (91)
MIT	18.8945	19.0581	19.3552	19.7638	20.0914	20.2595	20.2949	20.2891	20.1595	19.7228	19.2428	18.8771 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8945	19.0581	19.3552	19.7638	20.0914	20.2595	20.2949	20.2891	20.1595	19.7228	19.2428	18.8771 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9978	0.9950	0.9853	0.9473	0.8416	0.6513	0.4704	0.5448	0.8346	0.9756	0.9956	0.9984 (94)
Useful gains	423.4544	498.9061	588.0928	676.3450	675.3851	524.0271	358.8535	371.8062	489.8787	470.4658	414.5562	398.7922 (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	1487.7497	1439.2684	1303.2611	1087.2662	837.7804	558.6307	364.7119	383.0672	600.7581	910.8059	1218.2832	1480.0983 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	791.8356	631.9234	532.0852	295.8633	120.8221	0.0000	0.0000	0.0000	0.0000	327.6130	578.6834	804.4917 (98)
Space heating												4083.3179 (98)
Space heating per m2										(98) / (4) =		51.2593 (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	927.8472	730.4329	748.5822	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8665	0.9226	0.8886	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	803.9758	673.9298	665.1865	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1031.9526	981.3683	888.8458	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	164.1433	228.7342	166.4026	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												559.2801 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			

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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	41.0358	57.1836	41.6006	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													139.8200 (107)
Energy for space heating													1.7552 (108)
Energy for space cooling													51.2593 (99)
Total													1.7552 (108)
Target Fabric Energy Efficiency (TFEE)													53.0145 (109)
													61.0 (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	79.6600 (1b)	x 2.4000 (2b)	= 191.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					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)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1508 (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	0.1583	0.1508	0.1508	0.1395	0.1395	0.1244	0.1282	0.1206	0.1244	0.1319	0.1319	0.1432 (22b)
Mechanical extract ventilation - decentralised												0.1432 (22b)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			20.2300	1.2357	24.9990		(27)
WT-E-03	60.4300	20.2300	40.2000	0.1600	6.4320		(29a)
WT-I-02	3.1200	2.1200	1.0000	0.1584	0.1584		(29a)
Flat Roof	79.6600		79.6600	0.1500	11.9490		(30)
Total net area of external elements Aum(A, m ²)			143.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.6585		(33)
Party Wall 1			40.0800	0.0000	0.0000		(32)
Party Floor 1			79.6600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9222 (36)
Total fabric heat loss						(33) + (36) =	67.5807 (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	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454 (38)
Heat transfer coeff	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260 (39)
Average = Sum(39)m / 12 =												99.1260 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444 (40)
HLP (average)												1.2444 (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												2.4564 (42)
Average daily hot water use (litres/day)												92.5390 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.7929	98.0913	94.3898	90.6882	86.9866	83.2851	83.2851	86.9866	90.6882	94.3898	98.0913	101.7929 (44)
Energy conte	150.9559	132.0270	136.2400	118.7774	113.9697	98.3472	91.1331	104.5766	105.8256	123.3295	134.6238	146.1927 (45)
Energy content (annual)										Total = Sum(45)m =		1455.9986 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6434	19.8040	20.4360	17.8166	17.0955	14.7521	13.6700	15.6865	15.8738	18.4994	20.1936	21.9289 (46)

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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	14.1189	12.7361	14.0652	13.5713	13.9945	13.5094	13.9387	13.9749	13.5431	14.0359	13.6297	14.1074	(61)
Total heat required for water heating calculated for each month	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(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	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	53.7226	47.0830	48.8161	42.8863	41.3936	36.0778	33.7864	38.2654	38.5728	44.5160	48.1698	52.1359	(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	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7495	43.2989	35.2130	26.6585	19.9276	16.8237	18.1786	23.6292	31.7151	40.2696	47.0005	50.1044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	326.4604	329.8481	321.3113	303.1376	280.1966	258.6352	244.2309	240.8433	249.3800	267.5537	290.4948	312.0561	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	(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)	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	(71)
Water heating gains (Table 5)	72.2077	70.0640	65.6131	59.5643	55.6365	50.1080	45.4119	51.4320	53.5733	59.8334	66.9026	70.0752	(72)
Total internal gains	551.7399	547.5331	526.4596	493.6827	460.0828	429.8892	412.1436	420.2268	438.9906	471.9789	508.7201	536.5579	(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					9.7500	11.9814	0.4500	0.0000			0.7700	40.4778 (74)
West					10.4800	22.3313	0.4500	0.0000			0.7700	81.0922 (80)

Solar gains	121.5699	212.9196	350.7993	545.2523	673.2476	749.6888	700.9797	598.4066	447.4032	270.3294	154.8732	99.3750 (83)
Total gains	673.3098	760.4528	877.2589	1038.9349	1133.3305	1179.5780	1113.1234	1018.6334	886.3939	742.3083	663.5933	635.9329 (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	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229		
alpha	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882		
util living area	0.9272	0.9028	0.8456	0.7335	0.5784	0.3906	0.2678	0.2994	0.5490	0.7890	0.8968	0.9349	(86)	
MIT	18.9330	19.1758	19.6832	20.2654	20.7014	20.9242	20.9801	20.9735	20.8082	20.2484	19.4938	18.8683	(87)	
Th 2	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	(88)	
util rest of house	0.9164	0.8887	0.8230	0.6958	0.5204	0.3126	0.1748	0.1998	0.4681	0.7484	0.8789	0.9250	(89)	
MIT 2	18.0419	18.2772	18.7651	19.3052	19.6835	19.8492	19.8799	19.8779	19.7773	19.3076	18.5929	17.9794	(90)	
Living area fraction									fLA = Living area / (4) =			0.3728	(91)	
MIT	18.3741	18.6122	19.1074	19.6632	20.0630	20.2500	20.2901	20.2864	20.1617	19.6584	18.9288	18.3108	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	18.2241	18.4622	18.9574	19.5132	19.9130	20.1000	20.1401	20.1364	20.0117	19.5084	18.7788	18.1608	(93)	

8. Space heating requirement

Utilisation	0.8958	0.8664	0.8010	0.6819	0.5220	0.3282	0.1966	0.2229	0.4780	0.7325	0.8570	0.9053	(94)	
Useful gains	603.1743	658.8760	702.6663	708.4321	591.5832	387.1499	218.8238	227.0819	423.6917	543.7410	568.7073	575.7140	(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	1300.9421	1274.9818	1145.6389	952.9164	685.2561	406.4152	222.0557	231.5960	476.9608	783.9283	1068.4577	1294.6667	(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	519.1393	414.0231	329.5716	176.0287	69.6927	0.0000	0.0000	0.0000	0.0000	178.6993	359.8202	534.9008	(98)	
Space heating												2581.8757	(98)	
RHI space heating demand												2582	(98)	

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	79.6600 (1b)	x 2.4000 (2b)	= 191.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2600
Infiltration rate					0.1630 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1508 (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	0.1922	0.1885	0.1847	0.1659	0.1621	0.1432	0.1432	0.1395	0.1508	0.1621	0.1696	0.1772 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			20.2300	1.2357	24.9990		(27)
WT-E-03	60.4300	20.2300	40.2000	0.1600	6.4320		(29a)
WT-I-02	3.1200	2.1200	1.0000	0.1584	0.1584		(29a)
Flat Roof	79.6600		79.6600	0.1500	11.9490		(30)
Total net area of external elements Aum(A, m2)			143.2100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.6585	(33)
Party Wall 1			40.0800	0.0000	0.0000		(32)
Party Floor 1			79.6600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9222 (36)
Total fabric heat loss							(33) + (36) = 67.5807 (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	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454 (38)
Heat transfer coeff	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260 (39)
Average = Sum(39)m / 12 =												99.1260 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444 (40)
HLP (average)												1.2444 (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												2.4564 (42)
Average daily hot water use (litres/day)												92.5390 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.7929	98.0913	94.3898	90.6882	86.9866	83.2851	83.2851	86.9866	90.6882	94.3898	98.0913	101.7929 (44)
Energy conte	150.9559	132.0270	136.2400	118.7774	113.9697	98.3472	91.1331	104.5766	105.8256	123.3295	134.6238	146.1927 (45)
Energy content (annual)												Total = Sum(45)m = 1455.9986 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6434	19.8040	20.4360	17.8166	17.0955	14.7521	13.6700	15.6865	15.8738	18.4994	20.1936	21.9289 (46)

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Calculation Type: New Build (As Built)

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.1189	12.7361	14.0652	13.5713	13.9945	13.5094	13.9387	13.9749	13.5431	14.0359	13.6297	14.1074	(61)
Total heat required for water heating calculated for each month	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(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	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(64)
Heat gains from water heating, kWh/month	53.7226	47.0830	48.8161	42.8863	41.3936	36.0778	33.7864	38.2654	38.5728	44.5160	48.1698	52.1359	(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	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7495	43.2989	35.2130	26.6585	19.9276	16.8237	18.1786	23.6292	31.7151	40.2696	47.0005	50.1044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	326.4604	329.8481	321.3113	303.1376	280.1966	258.6352	244.2309	240.8433	249.3800	267.5537	290.4948	312.0561	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	(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)	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	(71)
Water heating gains (Table 5)	72.2077	70.0640	65.6131	59.5643	55.6365	50.1080	45.4119	51.4320	53.5733	59.8334	66.9026	70.0752	(72)
Total internal gains	551.7399	547.5331	526.4596	493.6827	460.0828	429.8892	412.1436	420.2268	438.9906	471.9789	508.7201	536.5579	(73)

6. Solar gains

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W
North				9.7500	10.6334	0.4500	0.0000				0.7700	35.9236 (74)
West				10.4800	19.6403	0.4500	0.0000				0.7700	71.3201 (80)

Solar gains	107.2437	208.1690	346.4212	522.4783	663.0935	690.6204	652.5232	543.9547	407.4847	247.2699	133.2441	88.5978 (83)
Total gains	658.9835	755.7022	872.8808	1016.1610	1123.1764	1120.5096	1064.6669	964.1814	846.4754	719.2489	641.9642	625.1558 (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)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229		
alpha	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882		
util living area	0.9366	0.9115	0.8623	0.7697	0.6400	0.4970	0.3822	0.4312	0.6340	0.8274	0.9142	0.9436	(86)	
MIT	18.7453	19.0300	19.5131	20.0938	20.5591	20.8317	20.9365	20.9126	20.6802	20.0535	19.2822	18.6645	(87)	
Th 2	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	(88)	
util rest of house	0.9274	0.8990	0.8428	0.7375	0.5907	0.4271	0.2945	0.3399	0.5658	0.7949	0.8998	0.9353	(89)	
MIT 2	17.8570	18.1343	18.6010	19.1475	19.5637	19.7864	19.8585	19.8462	19.6795	19.1275	18.3869	17.7780	(90)	
Living area fraction	18.1882	18.4683	18.9411	19.5003	19.9348	20.1761	20.2604	20.2438	20.0526	19.4728	18.7207	18.1085	(92)	
Temperature adjustment	18.0382	18.3183	18.7911	19.3503	19.7848	20.0261	20.1104	20.0938	19.9026	19.3228	18.5707	17.9585	(93)	
adjusted MIT														

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9079	0.8771	0.8201	0.7201	0.5860	0.4365	0.3129	0.3578	0.5670	0.7756	0.8785	0.9168	(94)
Ext temp.	598.2819	662.8428	715.8519	731.7849	658.1489	489.0594	333.1785	345.0127	479.9620	557.8238	563.9396	573.1181	(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	1361.8109	1330.0986	1218.3632	1035.8990	801.4146	537.8708	347.9731	366.1485	575.1880	864.6547	1137.0462	1363.8276	(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 per m ²	568.0655	448.3959	373.8684	218.9622	106.5897	0.0000	0.0000	0.0000	0.0000	228.2822	412.6367	588.2879	(98)
												2945.0885	(98)
												36.9707	(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													3254.2414 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	568.0655	448.3959	373.8684	218.9622	106.5897	0.0000	0.0000	0.0000	0.0000	228.2822	412.6367	588.2879	(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)	627.6967	495.4650	413.1143	241.9472	117.7786	0.0000	0.0000	0.0000	0.0000	252.2455	455.9522	650.0419	(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	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(64)
Efficiency of water heater (217)m	89.7592	89.6976	89.5587	89.2673	88.7257	87.3000	87.3000	87.3000	87.3000	89.2707	89.6316	89.7952	(216)
Fuel for water heating, kWh/month	183.9085	161.3902	167.8288	148.2611	144.2245	128.1290	120.3572	135.7978	136.7339	153.8752	165.4032	178.5176	(219)
Water heating fuel used													1824.4269 (219)
Annual totals kWh/year													
Space heating fuel - main system													3254.2414 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.2560, total flow = 34.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													42.9170 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													117.9170 (231)
Electricity for lighting (calculated in Appendix L)													344.3726 (232)
Total delivered energy for all uses													5540.9579 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3254.2414	3.4800	113.2476	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1824.4269	3.4800	63.4901	(247)
Mechanical ventilation fans	42.9170	13.1900	5.6608	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	344.3726	13.1900	45.4227	(250)
Additional standing charges			120.0000	(251)
Total energy cost			357.7137	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.2052 (257)
SAP value		83.1875
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	3254.2414	0.2160	702.9161	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1824.4269	0.2160	394.0762	(264)
Space and water heating			1096.9924	(265)
Pumps and fans	117.9170	0.5190	61.1989	(267)
Energy for lighting	344.3726	0.5190	178.7294	(268)
Total kg/year			1336.9207	(272)
CO2 emissions per m2			16.7800	(273)
EI value			85.6291	
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	$3.48 / 0.8874 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8874 = 0.2434$, stars = 4

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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	79.6600 (1b)	x 2.4000 (2b)	= 191.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 191.1840 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =									Air changes per hour			
Pressure test								0.0000 / (5) =	0.0000	(8)		
Measured/design AP50								Yes	3.2600			
Infiltration rate									0.1630	(18)		
Number of sides sheltered									1	(19)		
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.9250	(20)		
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.1508	(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	0.1583	0.1508	0.1508	0.1395	0.1395	0.1244	0.1282	0.1206	0.1244	0.1319	0.1319	0.1432 (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			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			20.2300	1.2357	24.9990		(27)
WT-E-03	60.4300	20.2300	40.2000	0.1600	6.4320		(29a)
WT-I-02	3.1200	2.1200	1.0000	0.1584	0.1584		(29a)
Flat Roof	79.6600		79.6600	0.1500	11.9490		(30)
Total net area of external elements Aum(A, m ²)			143.2100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.6585		(33)
Party Wall 1			40.0800	0.0000	0.0000		(32)
Party Floor 1			79.6600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.9222 (36)
Total fabric heat loss						(33) + (36) =	67.5807 (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	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454	31.5454 (38)
Heat transfer coeff	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260	99.1260 (39)
Average = Sum(39)m / 12 =												99.1260 (39)
HLP	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444	1.2444 (40)
HLP (average)												1.2444 (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												2.4564 (42)
Average daily hot water use (litres/day)												92.5390 (43)
Daily hot water use	Jan 101.7929	Feb 98.0913	Mar 94.3898	Apr 90.6882	May 86.9866	Jun 83.2851	Jul 83.2851	Aug 86.9866	Sep 90.6882	Oct 94.3898	Nov 98.0913	Dec 101.7929 (44)
Energy conte	150.9559	132.0270	136.2400	118.7774	113.9697	98.3472	91.1331	104.5766	105.8256	123.3295	134.6238	146.1927 (45)
Energy content (annual)												Total = Sum(45)m = 1455.9986 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6434	19.8040	20.4360	17.8166	17.0955	14.7521	13.6700	15.6865	15.8738	18.4994	20.1936	21.9289 (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	14.1189	12.7361	14.0652	13.5713	13.9945	13.5094	13.9387	13.9749	13.5431	14.0359	13.6297	14.1074	(61)
Total heat required for water heating calculated for each month	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(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	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(64)
Heat gains from water heating, kWh/month	53.7226	47.0830	48.8161	42.8863	41.3936	36.0778	33.7864	38.2654	38.5728	44.5160	48.1698	52.1359	(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	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	147.3827	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7495	43.2989	35.2130	26.6585	19.9276	16.8237	18.1786	23.6292	31.7151	40.2696	47.0005	50.1044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	326.4604	329.8481	321.3113	303.1376	280.1966	258.6352	244.2309	240.8433	249.3800	267.5537	290.4948	312.0561	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	52.1946	(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)	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	-98.2551	(71)
Water heating gains (Table 5)	72.2077	70.0640	65.6131	59.5643	55.6365	50.1080	45.4119	51.4320	53.5733	59.8334	66.9026	70.0752	(72)
Total internal gains	551.7399	547.5331	526.4596	493.6827	460.0828	429.8892	412.1436	420.2268	438.9906	471.9789	508.7201	536.5579	(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					9.7500	11.9814	0.4500		0.0000			0.7700			40.4778 (74)
West					10.4800	22.3313	0.4500		0.0000			0.7700			81.0922 (80)

Solar gains	121.5699	212.9196	350.7993	545.2523	673.2476	749.6888	700.9797	598.4066	447.4032	270.3294	154.8732	99.3750			(83)
Total gains	673.3098	760.4528	877.2589	1038.9349	1133.3305	1179.5780	1113.1234	1018.6334	886.3939	742.3083	663.5933	635.9329			(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)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	22.3229	
alpha	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	2.4882	
util living area	0.9272	0.9028	0.8456	0.7335	0.5784	0.3906	0.2678	0.2994	0.5490	0.7890	0.8968	0.9349	(86)
MIT	18.9330	19.1758	19.6832	20.2654	20.7014	20.9242	20.9801	20.9735	20.8082	20.2484	19.4938	18.8683	(87)
Th 2	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	19.8847	(88)
util rest of house	0.9164	0.8887	0.8230	0.6958	0.5204	0.3126	0.1748	0.1998	0.4681	0.7484	0.8789	0.9250	(89)
MIT 2	18.0419	18.2772	18.7651	19.3052	19.6835	19.8492	19.8799	19.8779	19.7773	19.3076	18.5929	17.9794	(90)
Living area fraction	18.3741	18.6122	19.1074	19.6632	20.0630	20.2500	20.2901	20.2864	20.1617	19.6584	18.9288	18.3108	(91)
MIT	18.3741	18.6122	19.1074	19.6632	20.0630	20.2500	20.2901	20.2864	20.1617	19.6584	18.9288	18.3108	(92)
Temperature adjustment	18.2241	18.4622	18.9574	19.5132	19.9130	20.1000	20.1401	20.1364	20.0117	19.5084	18.7788	18.1608	(93)
adjusted MIT	18.2241	18.4622	18.9574	19.5132	19.9130	20.1000	20.1401	20.1364	20.0117	19.5084	18.7788	18.1608	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	603.1743	658.8760	702.6663	708.4321	591.5832	387.1499	218.8238	227.0819	423.6917	543.7410	568.7073	575.7140	(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	1300.9421	1274.9818	1145.6389	952.9164	685.2561	406.4152	222.0557	231.5960	476.9608	783.9283	1068.4577	1294.6667	(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	519.1393	414.0231	329.5716	176.0287	69.6927	0.0000	0.0000	0.0000	0.0000	178.6993	359.8202	534.9008	(98)
Space heating												2581.8757	(98)
Space heating per m2												32.4112	(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													2852.9013 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	519.1393	414.0231	329.5716	176.0287	69.6927	0.0000	0.0000	0.0000	0.0000	178.6993	359.8202	534.9008	(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)	573.6346	457.4841	364.1675	194.5069	77.0085	0.0000	0.0000	0.0000	0.0000	197.4578	397.5914	591.0507	(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	165.0748	144.7631	150.3052	132.3487	127.9642	111.8566	105.0719	118.5515	119.3687	137.3655	148.2535	160.3002	(64)
Efficiency of water heater (217)m	89.7067	89.6487	89.4728	89.0983	88.4021	87.3000	87.3000	87.3000	87.3000	89.0809	89.5423	89.7415	(216)
Fuel for water heating, kWh/month	184.0161	161.4782	167.9899	148.5423	144.7524	128.1290	120.3572	135.7978	136.7339	154.2031	165.5682	178.6243	(219)
Water heating fuel used												1826.1924	(219)
Annual totals kWh/year													
Space heating fuel - main system												2852.9013	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.2560, total flow = 34.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													42.9170 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													117.9170 (231)
Electricity for lighting (calculated in Appendix L)													344.3726 (232)
Total delivered energy for all uses													5141.3833 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2852.9013	3.8700	110.4073 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1826.1924	3.8700	70.6736 (247)
Mechanical ventilation fans	42.9170	18.9000	8.1113 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	344.3726	18.9000	65.0864 (250)
Additional standing charges			93.0000 (251)
Total energy cost			361.4537 (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	2852.9013	0.2160	616.2267 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.1924	0.2160	394.4576 (264)
Space and water heating			1010.6842 (265)
Pumps and fans	117.9170	0.5190	61.1989 (267)
Energy for lighting	344.3726	0.5190	178.7294 (268)
Total kg/year			1250.6126 (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	2852.9013	1.2200	3480.5396 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.1924	1.2200	2227.9547 (264)
Space and water heating			5708.4944 (265)
Pumps and fans	117.9170	3.0700	362.0051 (267)
Energy for lighting	344.3726	3.0700	1057.2239 (268)
Primary energy kWh/year			7127.7234 (272)
Primary energy kWh/m2/year			89.4768 (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	£87	£87	£0
Mains gas	£274	£274	£0
Space heating	£226	£226	£0
Water heating	£71	£71	£0
Lighting	£65	£65	£0
Total cost of fuels	£361	£361	£0
Total cost of uses	£362	£362	£0
Delivered energy	65 kWh/m²	65 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	89 kWh/m²	89 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	East
Overshading	Average or unknown
Thermal mass parameter	100.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	378.54 (P1)
Transmission heat loss coefficient	67.58 (37)
Summer heat loss coefficient	446.12 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North	0.000	1.000	None
West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	9.7500	81.1852	0.4500	0.0000	0.9000	320.5800
West	10.4800	117.5071	0.4500	0.0000	0.9000	498.7470
total:						819.3270

Solar gains	Jun	Jul	Aug	
	876	819	699	(P4)
Internal gains	427	409	417	
Total summer gains	1303	1228	1117	(P5)
Summer gain/loss ratio	2.92	2.75	2.50	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	20.22	21.95	21.60	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			