

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW010d_207_As_Built				Issued on Date	15/07/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	84 B	DER	17.23	TER	18.98	
Environmental	87 B	% DER<TER	9.24			
CO ₂ Emissions (t/year)	1.03	DFEE	44.75	TFEE	53.13	
General Requirements Compliance	Pass	% DFEE<TFEE	15.77			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Mid-floor flat, total floor area 72 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.98 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.23 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.7 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (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	1.26 (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: 3.28 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1600
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing North: 4.06 m², No overhang
Windows facing East: 6.00 m², No overhang
Windows facing South: 5.24 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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3600 (1b)	x 2.3700 (2b)	= 171.4932 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.4932 (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					3.2800
Infiltration rate					0.1640 (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) =				0.1394 (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	0.1777	0.1743	0.1708	0.1533	0.1499	0.1324	0.1324	0.1289	0.1394	0.1499	0.1568	0.1638 (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)			15.3000	1.2357	18.9068		(27)
WT-E-01	56.7600	15.3000	41.4600	0.2000	8.2920		(29a)
WT-T-01 Common	3.0800	2.0600	1.0200	0.2544	0.2595		(29a)
Flat Roof	45.2400		45.2400	0.1500	6.7860		(30)
Total net area of external elements Aum(A, m ²)			105.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.3044	(33)
Party Wall 1					33.0900	0.0000	(32)
Party Floor 1					72.3600		(32d)
Party Ceilings 1					27.1200		(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.8721 (36)
Total fabric heat loss							(33) + (36) = 56.1764 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964 (38)
Heat transfer coeff	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728 (39)
Average = Sum(39)m / 12 =												84.4728 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674 (40)
HLP (average)												1.1674 (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												2.3020 (42)
Average daily hot water use (litres/day)												88.8732 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.7605	94.2056	90.6507	87.0957	83.5408	79.9859	79.9859	83.5408	87.0957	90.6507	94.2056	97.7605 (44)
Energy conte	144.9760	126.7970	130.8431	114.0722	109.4550	94.4513	87.5230	100.4340	101.6335	118.4440	129.2909	140.4015 (45)
Energy content (annual)												Total = Sum(45)m = 1398.3216 (45)
Distribution loss (46)m = 0.15 x (45)m												

Regs Region: England

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.7464	19.0195	19.6265	17.1108	16.4182	14.1677	13.1285	15.0651	15.2450	17.7666	19.3936	21.0602 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0967	12.7120	14.0412	13.5512	13.9760	13.4941	13.9246	13.9579	13.5252	14.0142	13.6051	14.0860 (61)
Total heat required for water heating calculated for each month	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (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	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (64)
								Total per year (kWh/year) = Sum(64)m =				1563.3059 (64)
Heat gains from water heating, kWh/month	51.7287	45.3380	47.0156	41.3168	39.8878	34.7786	32.5826	36.8838	37.1744	42.8862	46.3905	50.2050 (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	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.1157	16.0902	13.0855	9.9065	7.4052	6.2518	6.7553	8.7808	11.7856	14.9645	17.4658	18.6192 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	202.7413	204.8451	199.5435	188.2571	174.0101	160.6199	151.6744	149.5706	154.8722	166.1585	180.4056	193.7958 (68)
Pumps, fans	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812 (71)
Total internal gains	69.5278	67.4672	63.1931	57.3845	53.6126	48.3036	43.7938	49.5750	51.6312	57.6427	64.4313	67.4799 (72)
	350.9153	348.9330	336.3525	316.0786	295.5584	275.7058	262.7539	268.4568	278.8194	299.2962	322.8331	340.4253 (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				4.0600	10.6334	0.4500	0.0000			0.7700			14.9589 (74)
East				6.0000	19.6403	0.4500	0.0000			0.7700			40.8321 (76)
South				5.2400	46.7521	0.4500	0.0000			0.7700			84.8859 (78)
Solar gains	140.6769	247.4847	357.2100	470.0254	548.7959	553.9267	530.3109	470.6310	396.3868	278.7567	169.9853	119.3980	(83)
Total gains	491.5922	596.4177	693.5625	786.1040	844.3543	829.6325	793.0648	739.0879	675.2062	578.0530	492.8184	459.8234	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866
util living area	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658
	0.9965	0.9906	0.9734	0.9208	0.8010	0.6223	0.4628	0.5153	0.7659	0.9534	0.9922	0.9975 (86)
MIT	19.8087	20.0048	20.2887	20.6140	20.8586	20.9685	20.9940	20.9900	20.9149	20.5764	20.1135	19.7573 (87)
Th 2	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462 (88)
util rest of house	0.9954	0.9875	0.9645	0.8950	0.7436	0.5319	0.3550	0.4026	0.6822	0.9325	0.9891	0.9966 (89)
MIT 2	18.8693	19.0637	19.3421	19.6492	19.8573	19.9328	19.9448	19.9436	19.9032	19.6221	19.1728	18.8182 (90)
Living area fraction	0.9954	0.9875	0.9645	0.8950	0.7436	0.5319	0.3550	0.4026	0.6822	0.9325	0.9891	0.9966 (89)
MIT	19.2081	19.4032	19.6835	19.9972	20.2185	20.3064	20.3232	20.3210	20.2681	19.9663	19.5121	19.1569 (92)
Temperature adjustment	19.0581	19.2532	19.5335	19.8472	20.0685	20.1564	20.1732	20.1710	20.1181	19.8163	19.3621	-0.1500
adjusted MIT												19.0069 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9940	0.9848	0.9602	0.8922	0.7509	0.5507	0.3786	0.4272	0.6972	0.9293	0.9867	0.9956 (94)
Ext temp.	488.6501	587.3434	665.9419	701.3251	634.0395	456.9012	300.2920	315.7544	470.7643	537.2037	486.2801	457.7976 (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	1246.6577	1212.4524	1100.9802	924.7410	706.9081	469.3637	301.8402	318.5473	508.3694	778.5300	1035.8159	1250.7830 (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	563.9576	420.0733	323.6685	160.8595	54.2142	0.0000	0.0000	0.0000	0.0000	179.5467	395.6657	589.9812 (98)
												2687.9667 (98)
												(98) / (4) =
												37.1471 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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													2970.1290	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	563.9576	420.0733	323.6685	160.8595	54.2142	0.0000	0.0000	0.0000	0.0000	179.5467	395.6657	589.9812	(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)	623.1576	464.1694	357.6448	177.7453	59.9052	0.0000	0.0000	0.0000	0.0000	198.3942	437.1997	651.9129	(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	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875	(64)	
Efficiency of water heater (217)m	89.7760	89.6805	89.4857	89.0559	88.2523	87.3000	87.3000	87.3000	87.3000	89.1133	89.6283	89.8168	(216)	
Fuel for water heating, kWh/month	177.1885	155.5622	161.9077	143.3072	139.8615	123.6488	116.2057	131.0331	131.9115	148.6404	159.4318	172.0029	(219)	
Water heating fuel used												1760.7013	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2970.1290	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)														
mechanical ventilation fans (SFP = 0.1840)													38.4968	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													113.4968	(231)
Electricity for lighting (calculated in Appendix L)													319.9294	(232)
Total delivered energy for all uses													5164.2565	(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	2970.1290	0.2160	641.5479 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1760.7013	0.2160	380.3115 (264)
Space and water heating			1021.8593 (265)
Pumps and fans	113.4968	0.5190	58.9048 (267)
Energy for lighting	319.9294	0.5190	166.0434 (268)
Total CO2, kg/year			1246.8076 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2300 (273)

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

DER		17.2300	ZC1
Total Floor Area		72.3600	
Assumed number of occupants		2.3020	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.6031	ZC2
CO2 emissions from cooking, equation (L16)		2.4081	ZC3
Total CO2 emissions		36.2412	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		36.2412	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3600 (1b)	x 2.3700 (2b)	= 171.4932 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.4932 (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) = 0.1749 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4249 (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) =				0.3612 (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	0.4605	0.4515	0.4425	0.3973	0.3883	0.3431	0.3431	0.3341	0.3612	0.3883	0.4063	0.4244 (22b)
Effective ac	0.6060	0.6019	0.5979	0.5789	0.5754	0.5589	0.5589	0.5558	0.5652	0.5754	0.5826	0.5901 (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)			15.3000	1.3258	20.2841		(27)
WT-E-01	56.7600	15.3000	41.4600	0.1800	7.4628		(29a)
WT-I-01 Common	3.0800	2.0600	1.0200	0.1800	0.1836		(29a)
Flat Roof	45.2400		45.2400	0.1300	5.8812		(30)
Total net area of external elements Aum, m ²			105.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.8717	(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)							18.5275 (36)
Total fabric heat loss						(33) + (36) =	54.3992 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.2975	34.0645	33.8360	32.7632	32.5625	31.6280	31.6280	31.4550	31.9880	32.5625	32.9685	33.3931 (38)
Heat transfer coeff	88.6967	88.4637	88.2352	87.1624	86.9616	86.0272	86.0272	85.8542	86.3871	86.9616	87.3677	87.7923 (39)
Average = Sum(39)m / 12 =												87.1614 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2258	1.2225	1.2194	1.2046	1.2018	1.1889	1.1889	1.1865	1.1939	1.2018	1.2074	1.2133 (40)
HLP (average)												1.2046 (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												2.3020 (42)
Average daily hot water use (litres/day)												88.8732 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.7605	94.2056	90.6507	87.0957	83.5408	79.9859	79.9859	83.5408	87.0957	90.6507	94.2056	97.7605 (44)
Energy conte	144.9760	126.7970	130.8431	114.0722	109.4550	94.4513	87.5230	100.4340	101.6335	118.4440	129.2909	140.4015 (45)
Energy content (annual)										Total = Sum(45)m =		1398.3216 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7464	19.0195	19.6265	17.1108	16.4182	14.1677	13.1285	15.0651	15.2450	17.7666	19.3936	21.0602 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	49.8177	43.3604	46.1946	42.9513	42.5715	39.4451	40.7599	42.5715	42.9513	46.1946	46.4576	49.8177 (61)
Total heat required for water heating calculated for each month	194.7937	170.1573	177.0377	157.0235	152.0265	133.8964	128.2830	143.0055	144.5848	164.6386	175.7485	190.2192 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	194.7937	170.1573	177.0377	157.0235	152.0265	133.8964	128.2830	143.0055	144.5848	164.6386	175.7485	190.2192 (64)
Heat gains from water heating, kWh/month	60.6590	53.0001	55.0540	48.6668	47.0367	41.2663	39.2914	44.0372	44.5310	50.9313	54.6036	59.1379 (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	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1157	16.0902	13.0855	9.9065	7.4052	6.2518	6.7553	8.7808	11.7856	14.9645	17.4658	18.6192 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.7413	204.8451	199.5435	188.2571	174.0101	160.6199	151.6744	149.5706	154.8722	166.1585	180.4056	193.7958 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101 (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)	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812 (71)
Water heating gains (Table 5)	81.5309	78.8692	73.9973	67.5928	63.2213	57.3144	52.8110	59.1897	61.8486	68.4560	75.8384	79.4865 (72)
Total internal gains	362.9183	360.3349	347.1567	326.2869	305.1671	284.7165	271.7712	278.0716	289.0367	310.1095	334.2402	352.4319 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.0600	10.6334	0.6300		0.7000	0.7700	13.1938 (74)
East	6.0000	19.6403	0.6300		0.7000	0.7700	36.0139 (76)
South	5.2400	46.7521	0.6300		0.7000	0.7700	74.8693 (78)

Solar gains	124.0770	218.2815	315.0592	414.5624	484.0380	488.5634	467.7342	415.0966	349.6132	245.8635	149.9270	105.3091 (83)
Total gains	486.9953	578.6165	662.2159	740.8493	789.2051	773.2799	739.5054	693.1682	638.6499	555.9730	484.1672	457.7410 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	56.6538	56.8030	56.9500	57.6510	57.7841	58.4117	58.4117	58.5295	58.1684	57.7841	57.5155	57.2374
alpha	4.7769	4.7869	4.7967	4.8434	4.8523	4.8941	4.8941	4.9020	4.8779	4.8523	4.8344	4.8158
util living area	0.9967	0.9920	0.9791	0.9384	0.8391	0.6670	0.5022	0.5536	0.8000	0.9614	0.9929	0.9975 (86)
MIT	19.7251	19.9108	20.1912	20.5381	20.8116	20.9552	20.9908	20.9856	20.8904	20.5244	20.0576	19.6934 (87)
Th 2	19.8994	19.9020	19.9045	19.9163	19.9186	19.9289	19.9289	19.9308	19.9249	19.9186	19.9141	19.9094 (88)
util rest of house	0.9956	0.9893	0.9718	0.9166	0.7856	0.5733	0.3850	0.4330	0.7186	0.9433	0.9901	0.9967 (89)
MIT 2	18.2141	18.4861	18.8923	19.3872	19.7402	19.9003	19.9257	19.9252	19.8414	19.3801	18.7097	18.1749 (90)
Living area fraction									fLA = Living area / (4) =			0.3607 (91)
MIT	18.7591	19.0000	19.3608	19.8023	20.1267	20.2808	20.3099	20.3077	20.2198	19.7929	19.1959	18.7226 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7591	19.0000	19.3608	19.8023	20.1267	20.2808	20.3099	20.3077	20.2198	19.7929	19.1959	18.7226 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9939	0.9863	0.9671	0.9139	0.7970	0.6056	0.4275	0.4768	0.7433	0.9406	0.9874	0.9954 (94)
Ext temp.	484.0243	570.6747	640.4322	677.0647	628.9912	468.3047	316.1621	330.4843	474.6797	522.9680	478.0768	455.6221 (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	1282.4775	1247.3339	1134.7732	950.2713	732.7957	488.7044	319.1521	335.4900	528.6708	799.4279	1056.7908	1274.9748 (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	594.0492	454.7150	367.7897	196.7087	77.2306	0.0000	0.0000	0.0000	0.0000	205.6861	416.6741	609.5984 (98)
												2922.4518 (98)
										(98) / (4) =		40.3877 (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													3128.9634 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	594.0492	454.7150	367.7897	196.7087	77.2306	0.0000	0.0000	0.0000	0.0000	205.6861	416.6741	609.5984	(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)	636.0270	486.8469	393.7791	210.6089	82.6880	0.0000	0.0000	0.0000	0.0000	220.2207	446.1179	652.6750	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	194.7937	170.1573	177.0377	157.0235	152.0265	133.8964	128.2830	143.0055	144.5848	164.6386	175.7485	190.2192	(64)
Efficiency of water heater	87.6768	87.4063	86.8504	85.6195	83.4405	80.3000	80.3000	80.3000	80.3000	85.6127	87.1482	87.7743	(217)
Fuel for water heating, kWh/month	222.1724	194.6740	203.8422	183.3968	182.1975	166.7452	159.7546	178.0890	180.0558	192.3063	201.6662	216.7139	(219)
Water heating fuel used												2281.6140	(219)
Annual totals kWh/year													
Space heating fuel - main system												3128.9634	(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)												319.9294	(232)
Total delivered energy for all uses												5805.5068	(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	3128.9634	0.2160	675.8561 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2281.6140	0.2160	492.8286 (264)
Space and water heating			1168.6847 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.9294	0.5190	166.0434 (268)
Total CO2, kg/m2/year			1373.6531 (272)
Emissions per m2 for space and water heating			16.1510 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2947 (272b)
Emissions per m2 for pumps and fans			0.5379 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1510 * 1.00) + 2.2947 + 0.5379, rounded to 2 d.p.			18.9800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3600 (1b)	x 2.3700 (2b)	= 171.4932 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.4932 (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) = 0.1749 (8)
Measured/design AP50					Yes
Infiltration rate					3.2800
Number of sides sheltered					0.3389 (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) =	0.2881 (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	0.3673	0.3601	0.3529	0.3169	0.3097	0.2737	0.2737	0.2665	0.2881	0.3097	0.3241	0.3385 (22b)
	0.5675	0.5648	0.5623	0.5502	0.5480	0.5375	0.5375	0.5355	0.5415	0.5480	0.5525	0.5573 (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)			15.3000	1.2357	18.9068		(27)
WT-E-01	56.7600	15.3000	41.4600	0.2000	8.2920		(29a)
WT-I-01 Common	3.0800	2.0600	1.0200	0.2544	0.2595		(29a)
Flat Roof	45.2400		45.2400	0.1500	6.7860		(30)
Total net area of external elements Aum, m ²			105.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3044		(33)
Party Wall 1			33.0900	0.0000	0.0000		(32)
Party Floor 1			72.3600				(32d)
Party Ceilings 1			27.1200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.8721 (36)
Total fabric heat loss						(33) + (36) =	56.1764 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.1142	31.9660	31.8207	31.1381	31.0104	30.4159	30.4159	30.3059	30.6449	31.0104	31.2688	31.5388 (38)
Heat transfer coeff	88.2907	88.1424	87.9971	87.3145	87.1868	86.5924	86.5924	86.4823	86.8214	87.1868	87.4452	87.7153 (39)
Average = Sum(39)m / 12 =												87.3139 (39)
HLP	1.2202	1.2181	1.2161	1.2067	1.2049	1.1967	1.1967	1.1952	1.1999	1.2049	1.2085	1.2122 (40)
HLP (average)												1.2067 (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												2.3020 (42)
Average daily hot water use (litres/day)												88.8732 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.7605	94.2056	90.6507	87.0957	83.5408	79.9859	79.9859	83.5408	87.0957	90.6507	94.2056	97.7605 (44)
Energy conte	144.9760	126.7970	130.8431	114.0722	109.4550	94.4513	87.5230	100.4340	101.6335	118.4440	129.2909	140.4015 (45)
Energy content (annual)										Total = Sum(45)m =		1398.3216 (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												

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 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	30.8074	26.9444	27.8042	24.2403	23.2592	20.0709	18.5986	21.3422	21.5971	25.1694	27.4743	29.8353 (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	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1157	16.0902	13.0855	9.9065	7.4052	6.2518	6.7553	8.7808	11.7856	14.9645	17.4658	18.6192 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.7413	204.8451	199.5435	188.2571	174.0101	160.6199	151.6744	149.5706	154.8722	166.1585	180.4056	193.7958 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101 (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)	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812 (71)
Water heating gains (Table 5)	41.4078	40.0958	37.3712	33.6671	31.2623	27.8763	24.9982	28.6858	29.9960	33.8298	38.1588	40.1012 (72)
Total internal gains	319.7953	318.5615	307.5306	289.3613	270.2081	252.2784	240.9584	244.5676	254.1842	272.4833	293.5606	310.0467 (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				4.0600	10.6334	0.4500	0.0000	0.7700	14.9589 (74)			
East				6.0000	19.6403	0.4500	0.0000	0.7700	40.8321 (76)			
South				5.2400	46.7521	0.4500	0.0000	0.7700	84.8859 (78)			
Solar gains	140.6769	247.4847	357.2100	470.0254	548.7959	553.9267	530.3109	470.6310	396.3868	278.7567	169.9853	119.3980 (83)
Total gains	460.4722	566.0463	664.7406	759.3866	819.0040	806.2052	771.2693	715.1987	650.5710	551.2400	463.5459	429.4448 (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	56.9143	57.0100	57.1042	57.5505	57.6348	58.0305	58.0305	58.1044	57.8775	57.6348	57.4646	57.2876
alpha	4.7943	4.8007	4.8069	4.8367	4.8423	4.8687	4.8687	4.8736	4.8585	4.8423	4.8310	4.8192
util living area	0.9974	0.9927	0.9787	0.9334	0.8247	0.6484	0.4858	0.5416	0.7934	0.9628	0.9941	0.9981 (86)
MIT	19.6990	19.9011	20.1980	20.5533	20.8260	20.9596	20.9919	20.9865	20.8934	20.5168	20.0308	19.6589 (87)
Th 2	19.9039	19.9055	19.9071	19.9147	19.9161	19.9227	19.9227	19.9239	19.9201	19.9161	19.9132	19.9102 (88)
util rest of house	0.9965	0.9902	0.9713	0.9103	0.7690	0.5550	0.3711	0.4223	0.7109	0.9451	0.9917	0.9975 (89)
MIT 2	18.7264	18.9285	19.2221	19.5672	19.8049	19.9053	19.9207	19.9203	19.8651	19.5418	19.0647	18.6915 (90)
Living area fraction									fLA = Living area / (4) =			0.3607 (91)
MIT	19.0772	19.2793	19.5741	19.9229	20.1732	20.2856	20.3071	20.3049	20.2360	19.8935	19.4132	19.0404 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0772	19.2793	19.5741	19.9229	20.1732	20.2856	20.3071	20.3049	20.2360	19.8935	19.4132	19.0404 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	458.4458	559.4488	643.7813	691.4142	641.6745	473.9427	318.3641	333.0481	479.7549	520.7369	459.0109	428.0684 (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	1304.6923	1267.4267	1150.4831	962.4578	738.7523	492.3273	321.0055	337.7049	532.7336	810.2687	1076.7266	1301.7335 (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	629.6074	475.7611	376.9861	195.1514	72.2258	0.0000	0.0000	0.0000	0.0000	215.4116	444.7553	650.0069 (98)
Space heating												3059.9057 (98)
Space heating per m ²										(98) / (4) =		42.2873 (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	813.9682	640.7835	657.2653	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9104	0.9532	0.9359	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	741.0221	610.7992	615.1153	0.0000	0.0000	0.0000	0.0000 (102)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	206.5079	278.6025	227.6679	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												712.7783 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	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	0.0000	51.6270	69.6506	56.9170	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												178.1946 (107)
Space cooling per m2												2.4626 (108)
Energy for space heating												42.2873 (99)
Energy for space cooling												2.4626 (108)
Total												44.7499 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3600 (1b)	x 2.3700 (2b)	= 171.4932 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.4932 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1749 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4249 (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) =	0.3612 (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	0.4605	0.4515	0.4425	0.3973	0.3883	0.3431	0.3431	0.3341	0.3612	0.3883	0.4063	0.4244 (22b)
Effective ac	0.6060	0.6019	0.5979	0.5789	0.5754	0.5589	0.5589	0.5558	0.5652	0.5754	0.5826	0.5901 (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)			15.3000	1.3258	20.2841		(27)
WT-E-01	56.7600	15.3000	41.4600	0.1800	7.4628		(29a)
WT-I-01 Common	3.0800	2.0600	1.0200	0.1800	0.1836		(29a)
Flat Roof	45.2400		45.2400	0.1300	5.8812		(30)
Total net area of external elements Aum, m ²			105.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.8717		(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)							18.5275 (36)
Total fabric heat loss						(33) + (36) =	54.3992 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.2975	34.0645	33.8360	32.7632	32.5625	31.6280	31.6280	31.4550	31.9880	32.5625	32.9685	33.3931 (38)
Heat transfer coeff	88.6967	88.4637	88.2352	87.1624	86.9616	86.0272	86.0272	85.8542	86.3871	86.9616	87.3677	87.7923 (39)
Average = Sum(39)m / 12 =												87.1614 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2258	1.2225	1.2194	1.2046	1.2018	1.1889	1.1889	1.1865	1.1939	1.2018	1.2074	1.2133 (40)
HLP (average)												1.2046 (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												2.3020 (42)
Average daily hot water use (litres/day)												88.8732 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.7605	94.2056	90.6507	87.0957	83.5408	79.9859	79.9859	83.5408	87.0957	90.6507	94.2056	97.7605 (44)
Energy conte	144.9760	126.7970	130.8431	114.0722	109.4550	94.4513	87.5230	100.4340	101.6335	118.4440	129.2909	140.4015 (45)
Energy content (annual)										Total = Sum(45)m =		1398.3216 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.8074	26.9444	27.8042	24.2403	23.2592	20.0709	18.5986	21.3422	21.5971	25.1694	27.4743	29.8353 (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	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015	115.1015 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1157	16.0902	13.0855	9.9065	7.4052	6.2518	6.7553	8.7808	11.7856	14.9645	17.4658	18.6192 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.7413	204.8451	199.5435	188.2571	174.0101	160.6199	151.6744	149.5706	154.8722	166.1585	180.4056	193.7958 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101	34.5101 (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)	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812 (71)
Water heating gains (Table 5)	41.4078	40.0958	37.3712	33.6671	31.2623	27.8763	24.9982	28.6858	29.9960	33.8298	38.1588	40.1012 (72)
Total internal gains	319.7953	318.5615	307.5306	289.3613	270.2081	252.2784	240.9584	244.5676	254.1842	272.4833	293.5606	310.0467 (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		4.0600	10.6334	0.6300	0.7000	0.7700	13.1938 (74)
East		6.0000	19.6403	0.6300	0.7000	0.7700	36.0139 (76)
South		5.2400	46.7521	0.6300	0.7000	0.7700	74.8693 (78)

Solar gains	124.0770	218.2815	315.0592	414.5624	484.0380	488.5634	467.7342	415.0966	349.6132	245.8635	149.9270	105.3091 (83)
Total gains	443.8723	536.8431	622.5898	703.9236	754.2461	740.8418	708.6926	659.6642	603.7973	518.3467	443.4876	415.3558 (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	56.6538	56.8030	56.9500	57.6510	57.7841	58.4117	58.4117	58.5295	58.1684	57.7841	57.5155	57.2374
alpha	4.7769	4.7869	4.7967	4.8434	4.8523	4.8941	4.8941	4.9020	4.8779	4.8523	4.8344	4.8158
util living area	0.9978	0.9941	0.9835	0.9482	0.8567	0.6891	0.5223	0.5783	0.8245	0.9702	0.9951	0.9984 (86)
MIT	19.6707	19.8592	20.1450	20.5024	20.7910	20.9484	20.9892	20.9826	20.8735	20.4838	20.0070	19.6396 (87)
Th 2	19.8994	19.9020	19.9045	19.9163	19.9186	19.9289	19.9289	19.9308	19.9249	19.9186	19.9141	19.9094 (88)
util rest of house	0.9970	0.9921	0.9776	0.9291	0.8061	0.5949	0.4012	0.4540	0.7466	0.9555	0.9931	0.9978 (89)
MIT 2	18.6947	18.8843	19.1687	19.5229	19.7813	19.9061	19.9263	19.9261	19.8574	19.5135	19.0418	18.6716 (90)
Living area fraction									fLA = Living area / (4) =			0.3607 (91)
MIT	19.0467	19.2359	19.5209	19.8762	20.1455	20.2820	20.3097	20.3072	20.2239	19.8634	19.3899	19.0207 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0467	19.2359	19.5209	19.8762	20.1455	20.2820	20.3097	20.3072	20.2239	19.8634	19.3899	19.0207 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9962	0.9905	0.9750	0.9283	0.8179	0.6277	0.4453	0.4993	0.7708	0.9546	0.9918	0.9972 (94)
Useful gains	442.1894	531.7538	607.0480	653.4375	616.9025	465.0286	315.5653	329.3457	465.3958	494.8054	439.8442	414.1976 (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	1307.9836	1268.2078	1148.8993	956.7096	734.4345	488.8089	319.1323	335.4487	529.0276	805.5646	1073.7433	1301.1463 (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	644.1509	494.8971	403.1374	218.3560	87.4438	0.0000	0.0000	0.0000	0.0000	231.2048	456.4074	659.8899 (98)
Space heating												3195.4872 (98)
Space heating per m2										(98) / (4) =		44.1610 (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	808.6558	636.6014	652.4917	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8902	0.9409	0.9214	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	719.8336	599.0066	601.1931	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	951.4399	912.1233	856.2101	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	166.7566	232.9589	189.7327	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												589.4481 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	41.6891	58.2397	47.4332	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											147.3620 (107)
Space cooling per m2											2.0365 (108)
Energy for space heating											44.1610 (99)
Energy for space cooling											2.0365 (108)
Total											46.1975 (109)
Target Fabric Energy Efficiency (TFEE)											53.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3600 (1b)	x 2.3700 (2b)	= 171.4932 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.4932 (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					3.2800
Infiltration rate					0.1640 (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) =				0.1394 (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	0.1464	0.1394	0.1394	0.1289	0.1289	0.1150	0.1185	0.1115	0.1150	0.1220	0.1220	0.1324 (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)			15.3000	1.2357	18.9068		(27)
WT-E-01	56.7600	15.3000	41.4600	0.2000	8.2920		(29a)
WT-I-01 Common	3.0800	2.0600	1.0200	0.2544	0.2595		(29a)
Flat Roof	45.2400		45.2400	0.1500	6.7860		(30)
Total net area of external elements Aum(A, m ²)				105.0800			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3044		(33)
Party Wall 1				33.0900	0.0000		(32)
Party Floor 1				72.3600			(32d)
Party Ceilings 1				27.1200			(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.8721 (36)
Total fabric heat loss							(33) + (36) = 56.1764 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964 (38)
Heat transfer coeff	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728 (39)
Average = Sum(39)m / 12 =												84.4728 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674 (40)
HLP (average)												1.1674 (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												2.3020 (42)
Average daily hot water use (litres/day)												88.8732 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.7605	94.2056	90.6507	87.0957	83.5408	79.9859	79.9859	83.5408	87.0957	90.6507	94.2056	97.7605 (44)
Energy conte	144.9760	126.7970	130.8431	114.0722	109.4550	94.4513	87.5230	100.4340	101.6335	118.4440	129.2909	140.4015 (45)
Energy content (annual)												Total = Sum(45)m = 1398.3216 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	21.7464	19.0195	19.6265	17.1108	16.4182	14.1677	13.1285	15.0651	15.2450	17.7666	19.3936	21.0602 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0967	12.7120	14.0412	13.5512	13.9760	13.4941	13.9246	13.9579	13.5252	14.0142	13.6051	14.0860 (61)
Total heat required for water heating calculated for each month	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (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	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (64)
								Total per year (kWh/year) = Sum(64)m =				1563.3059 (64)
RHI water heating demand												1563 (64)
Heat gains from water heating, kWh/month	51.7287	45.3380	47.0156	41.3168	39.8878	34.7786	32.5826	36.8838	37.1744	42.8862	46.3905	50.2050 (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	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2893	40.2256	32.7136	24.7663	18.5131	15.6296	16.8883	21.9520	29.4640	37.4113	43.6645	46.5481 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.5989	305.7389	297.8262	280.9808	259.7166	239.7312	226.3797	223.2397	231.1525	247.9978	269.2621	289.2475 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142 (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)	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812 (71)
Water heating gains (Table 5)	69.5278	67.4672	63.1931	57.3845	53.6126	48.3036	43.7938	49.5750	51.6312	57.6427	64.4313	67.4799 (72)
Total internal gains	517.5709	513.5866	493.8877	463.2864	431.9971	403.8191	387.2166	394.9215	412.4024	443.2066	477.5126	503.4302 (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	4.0600				11.9814		0.4500		0.0000		0.7700		16.8554 (74)	
East	6.0000				22.3313		0.4500		0.0000		0.7700		46.4268 (76)	
South	5.2400				50.9848		0.4500		0.0000		0.7700		92.5711 (78)	
Solar gains	155.8533	246.9963	353.1721	481.0319	549.1529	594.0697	562.2356	508.7912	425.5147	297.3052	192.9807	130.9768	(83)	
Total gains	673.4242	760.5828	847.0598	944.3183	981.1500	997.8888	949.4522	903.7127	837.9171	740.5119	670.4933	634.4069	(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	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866
alpha	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658
util living area	0.9836	0.9699	0.9309	0.8294	0.6510	0.4198	0.2755	0.2986	0.5671	0.8600	0.9645	0.9871 (86)
MIT	20.1192	20.2713	20.5339	20.8002	20.9521	20.9956	20.9996	20.9994	20.9809	20.7966	20.4159	20.0725 (87)
Th 2	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462 (88)
util rest of house	0.9784	0.9607	0.9105	0.7850	0.5784	0.3331	0.1820	0.2006	0.4720	0.8113	0.9517	0.9830 (89)
MIT 2	19.1760	19.3236	19.5728	19.8073	19.9213	19.9449	19.9461	19.9461	19.9391	19.8113	19.4662	19.1304 (90)
Living area fraction									fLA = Living area / (4) =			0.3607 (91)
MIT	19.5162	19.6655	19.9195	20.1654	20.2931	20.3239	20.3261	20.3260	20.3149	20.1667	19.8087	19.4702 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3662	19.5155	19.7695	20.0154	20.1431	20.1739	20.1761	20.1760	20.1649	20.0167	19.6587	19.3202 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9747	0.9561	0.9065	0.7882	0.5926	0.3520	0.2024	0.2220	0.4924	0.8150	0.9474	0.9797 (94)
Useful gains	656.3797	727.1928	767.8632	744.3260	581.4065	351.2765	192.2143	200.6204	412.5495	603.5154	635.2175	621.5500 (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	1205.1093	1175.4787	1044.8856	854.4800	603.3956	352.5802	192.2695	200.7092	419.3982	710.9827	984.8466	1201.2225 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	408.2548	301.2481	206.1047	79.3109	16.3599	0.0000	0.0000	0.0000	0.0000	79.9556	251.7330	431.2764 (98)
Space heating												1774.2434 (98)
RHI space heating demand												1774 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3600 (1b)	x 2.3700 (2b)	= 171.4932 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.4932 (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)				
								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							3.2800					
Infiltration rate							0.1640	(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) =	0.1394 (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 (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												
	0.1777	0.1743	0.1708	0.1533	0.1499	0.1324	0.1324	0.1289	0.1394	0.1499	0.1568	0.1638 (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)			15.3000	1.2357	18.9068		(27)
WT-E-01	56.7600	15.3000	41.4600	0.2000	8.2920		(29a)
WT-T-01 Common	3.0800	2.0600	1.0200	0.2544	0.2595		(29a)
Flat Roof	45.2400		45.2400	0.1500	6.7860		(30)
Total net area of external elements Aum(A, m ²)				105.0800			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3044		(33)
Party Wall 1				33.0900	0.0000		(32)
Party Floor 1				72.3600			(32d)
Party Ceilings 1				27.1200			(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.8721 (36)
Total fabric heat loss							(33) + (36) = 56.1764 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964	28.2964 (38)
Heat transfer coeff	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728	84.4728 (39)
Average = Sum(39)m / 12 =												84.4728 (39)
HLP	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674	1.1674 (40)
HLP (average)												1.1674 (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												2.3020 (42)
Average daily hot water use (litres/day)												88.8732 (43)
Daily hot water use	Jan 97.7605	Feb 94.2056	Mar 90.6507	Apr 87.0957	May 83.5408	Jun 79.9859	Jul 79.9859	Aug 83.5408	Sep 87.0957	Oct 90.6507	Nov 94.2056	Dec 97.7605 (44)
Energy conte	144.9760	126.7970	130.8431	114.0722	109.4550	94.4513	87.5230	100.4340	101.6335	118.4440	129.2909	140.4015 (45)
Energy content (annual)												Total = Sum(45)m = 1398.3216 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	21.7464	19.0195	19.6265	17.1108	16.4182	14.1677	13.1285	15.0651	15.2450	17.7666	19.3936	21.0602 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0967	12.7120	14.0412	13.5512	13.9760	13.4941	13.9246	13.9579	13.5252	14.0142	13.6051	14.0860 (61)
Total heat required for water heating calculated for each month	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (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	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (64)
Heat gains from water heating, kWh/month	51.7287	45.3380	47.0156	41.3168	39.8878	34.7786	32.5826	36.8838	37.1744	42.8862	46.3905	50.2050 (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	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2893	40.2256	32.7136	24.7663	18.5131	15.6296	16.8883	21.9520	29.4640	37.4113	43.6645	46.5481 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.5989	305.7389	297.8262	280.9808	259.7166	239.7312	226.3797	223.2397	231.1525	247.9978	269.2621	289.2475 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142 (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)	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812 (71)
Water heating gains (Table 5)	69.5278	67.4672	63.1931	57.3845	53.6126	48.3036	43.7938	49.5750	51.6312	57.6427	64.4313	67.4799 (72)
Total internal gains	517.5709	513.5866	493.8877	463.2864	431.9971	403.8191	387.2166	394.9215	412.4024	443.2066	477.5126	503.4302 (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				4.0600	10.6334		0.4500		0.0000		0.7700		14.9589 (74)
East				6.0000	19.6403		0.4500		0.0000		0.7700		40.8321 (76)
South				5.2400	46.7521		0.4500		0.0000		0.7700		84.8859 (78)
Solar gains	140.6769	247.4847	357.2100	470.0254	548.7959	553.9267	530.3109	470.6310	396.3868	278.7567	169.9853	119.3980	(83)
Total gains	658.2478	761.0713	851.0976	933.3118	980.7930	957.7459	917.5275	865.5525	808.7892	721.9634	647.4979	622.8282	(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	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866
alpha	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658
util living area	0.9878	0.9745	0.9435	0.8678	0.7288	0.5496	0.4024	0.4443	0.6746	0.9025	0.9760	0.9905 (86)
MIT	20.0161	20.2000	20.4542	20.7255	20.9084	20.9816	20.9968	20.9948	20.9518	20.7064	20.2985	19.9621 (87)
Th 2	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462 (88)
util rest of house	0.9840	0.9670	0.9272	0.8323	0.6670	0.4655	0.3075	0.3449	0.5889	0.8673	0.9675	0.9876 (89)
MIT 2	19.0742	19.2540	19.4976	19.7439	19.8913	19.9387	19.9454	19.9449	19.9235	19.7348	19.3527	19.0211 (90)
Living area fraction	19.4139	19.5952	19.8426	20.0980	20.2582	20.3149	20.3246	20.3236	20.2944	20.0853	19.6938	19.3605 (92)
Temperature adjustment	19.2639	19.4452	19.6926	19.9480	20.1082	20.1649	20.1746	20.1736	20.1444	19.9353	19.5438	-0.1500
adjusted MIT												19.2105 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	645.6372	732.5867	785.1608	776.8430	664.0755	462.9924	301.1472	317.3479	490.0929	625.8424	623.7596	613.4080 (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	1264.0447	1228.6742	1114.4198	933.2531	710.2622	470.0800	301.9607	318.7631	510.5865	788.5769	1051.1637	1267.9784 (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	460.0952	333.3707	244.9687	112.6153	34.3629	0.0000	0.0000	0.0000	0.0000	121.0744	307.7309	487.0004 (98)
Space heating												2101.2186 (98)
Space heating per m2												29.0384 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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	2321.7885 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	460.0952	333.3707	244.9687	112.6153	34.3629	0.0000	0.0000	0.0000	0.0000	121.0744	307.7309	487.0004 (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)	508.3925	368.3655	270.6836	124.4368	37.9701	0.0000	0.0000	0.0000	0.0000	133.7839	340.0341	538.1220 (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	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (64)
Efficiency of water heater (217)m	89.6557	89.5318	89.2837	88.7714	87.9774	87.3000	87.3000	87.3000	87.3000	88.7994	89.4602	87.3000 (216)
Fuel for water heating, kWh/month	177.4263	155.8205	162.2741	143.7664	140.2985	123.6488	116.2057	131.0331	131.9115	149.1656	159.7315	172.2114 (219)
Water heating fuel used												1763.4933 (219)
Annual totals kWh/year												
Space heating fuel - main system												2321.7885 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)												
mechanical ventilation fans (SFP = 0.1840)												38.4968 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												113.4968 (231)
Electricity for lighting (calculated in Appendix L)												319.9294 (232)
Total delivered energy for all uses												4518.7081 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2321.7885	3.4800	80.7982 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1763.4933	3.4800	61.3696 (247)
Mechanical ventilation fans	38.4968	13.1900	5.0777 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	319.9294	13.1900	42.1987 (250)
Additional standing charges			120.0000 (251)
Total energy cost			319.3367 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =		1.1428 (257)
SAP value			84.0577
SAP rating (Section 12)			84 (258)
SAP band			B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2321.7885	0.2160	501.5063 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1763.4933	0.2160	380.9146 (264)
Space and water heating			882.4209 (265)
Pumps and fans	113.4968	0.5190	58.9048 (267)
Energy for lighting	319.9294	0.5190	166.0434 (268)
Total kg/year			1107.3691 (272)
CO2 emissions per m2			15.3000 (273)
EI value			87.3562
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8853 = 3.931$, stars = 4
Water heating environmental impact	$0.216 / 0.8853 = 0.2440$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3600 (1b)	x 2.3700 (2b)	= 171.4932 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.4932 (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)			
									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									3.2800			
Infiltration rate									0.1640 (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) =	0.1394 (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)
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												
	0.1464	0.1394	0.1394	0.1289	0.1289	0.1150	0.1185	0.1115	0.1150	0.1220	0.1220	0.1324 (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 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)			15.3000	1.2357	18.9068		(27)
WT-E-01	56.7600	15.3000	41.4600	0.2000	8.2920		(29a)
WT-I-01 Common	3.0800	2.0600	1.0200	0.2544	0.2595		(29a)
Flat Roof	45.2400		45.2400	0.1500	6.7860		(30)
Total net area of external elements Aum(A, m2)			105.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3044		(33)
Party Wall 1			33.0900	0.0000	0.0000		(32)
Party Floor 1			72.3600				(32d)
Party Ceilings 1			27.1200				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.8721 (36)
Total fabric heat loss							(33) + (36) = 56.1764 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3020 (42)
Average daily hot water use (litres/day)												88.8732 (43)
Daily hot water use	Jan 97.7605	Feb 94.2056	Mar 90.6507	Apr 87.0957	May 83.5408	Jun 79.9859	Jul 79.9859	Aug 83.5408	Sep 87.0957	Oct 90.6507	Nov 94.2056	Dec 97.7605 (44)
Energy conte	144.9760	126.7970	130.8431	114.0722	109.4550	94.4513	87.5230	100.4340	101.6335	118.4440	129.2909	140.4015 (45)
Energy content (annual)												Total = Sum(45)m = 1398.3216 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	21.7464	19.0195	19.6265	17.1108	16.4182	14.1677	13.1285	15.0651	15.2450	17.7666	19.3936	21.0602 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0967	12.7120	14.0412	13.5512	13.9760	13.4941	13.9246	13.9579	13.5252	14.0142	13.6051	14.0860 (61)
Total heat required for water heating calculated for each month	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (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	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875 (64)
								Total per year (kWh/year) = Sum(64)m =				1563.3059 (64)
Heat gains from water heating, kWh/month	51.7287	45.3380	47.0156	41.3168	39.8878	34.7786	32.5826	36.8838	37.1744	42.8862	46.3905	50.2050 (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
	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218	138.1218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.2893	40.2256	32.7136	24.7663	18.5131	15.6296	16.8883	21.9520	29.4640	37.4113	43.6645	46.5481 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.5989	305.7389	297.8262	280.9808	259.7166	239.7312	226.3797	223.2397	231.1525	247.9978	269.2621	289.2475 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142	51.1142 (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)	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812	-92.0812 (71)
Water heating gains (Table 5)	69.5278	67.4672	63.1931	57.3845	53.6126	48.3036	43.7938	49.5750	51.6312	57.6427	64.4313	67.4799 (72)
Total internal gains	517.5709	513.5866	493.8877	463.2864	431.9971	403.8191	387.2166	394.9215	412.4024	443.2066	477.5126	503.4302 (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												4.0600	11.9814	0.4500	0.0000	0.7700	16.8554 (74)
East												6.0000	22.3313	0.4500	0.0000	0.7700	46.4268 (76)
South												5.2400	50.9848	0.4500	0.0000	0.7700	92.5711 (78)
Solar gains	155.8533	246.9963	353.1721	481.0319	549.1529	594.0697	562.2356	508.7912	425.5147	297.3052	192.9807	130.9768 (83)					
Total gains	673.4242	760.5828	847.0598	944.3183	981.1500	997.8888	949.4522	903.7127	837.9171	740.5119	670.4933	634.4069 (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	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866	59.4866
util living area	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658	4.9658
	0.9836	0.9699	0.9309	0.8294	0.6510	0.4198	0.2755	0.2986	0.5671	0.8600	0.9645	0.9871 (86)
MIT	20.1192	20.2713	20.5339	20.8002	20.9521	20.9956	20.9996	20.9994	20.9809	20.7966	20.4159	20.0725 (87)
Th 2	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462	19.9462 (88)
util rest of house	0.9784	0.9607	0.9105	0.7850	0.5784	0.3331	0.1820	0.2006	0.4720	0.8113	0.9517	0.9830 (89)
MIT 2	19.1760	19.3236	19.5728	19.8073	19.9213	19.9449	19.9461	19.9461	19.9391	19.8113	19.4662	19.1304 (90)
Living area fraction	19.5162	19.6655	19.9195	20.1654	20.2931	20.3239	20.3261	20.3260	20.3149	20.1667	19.8087	19.4702 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3662	19.5155	19.7695	20.0154	20.1431	20.1739	20.1761	20.1760	20.1649	20.0167	19.6587	19.3202 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9747	0.9561	0.9065	0.7882	0.5926	0.3520	0.2024	0.2220	0.4924	0.8150	0.9474	0.9797 (94)
Ext temp.	656.3797	727.1928	767.8632	744.3260	581.4065	351.2765	192.2143	200.6204	412.5495	603.5154	635.2175	621.5500 (95)
Heat loss rate W	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)
Month fracti	1205.1093	1175.4787	1044.8856	854.4800	603.3956	352.5802	192.2695	200.7092	419.3982	710.9827	984.8466	1201.2225 (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	408.2548	301.2481	206.1047	79.3109	16.3599	0.0000	0.0000	0.0000	0.0000	79.9556	251.7330	431.2764 (98)
												1774.2434 (98)
												24.5197 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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													1960.4900	(211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	408.2548	301.2481	206.1047	79.3109	16.3599	0.0000	0.0000	0.0000	0.0000	79.9556	251.7330	431.2764	(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)	451.1103	332.8709	227.7400	87.6363	18.0773	0.0000	0.0000	0.0000	0.0000	88.3488	278.1580	476.5485	(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	159.0727	139.5089	144.8843	127.6234	123.4310	107.9454	101.4476	114.3919	115.1587	132.4583	142.8960	154.4875	(64)	
Efficiency of water heater (217)m	89.5793	89.4620	89.1511	88.4993	87.6628	87.3000	87.3000	87.3000	87.3000	88.4776	89.3145	89.6335	(216)	
Fuel for water heating, kWh/month	177.5775	155.9420	162.5155	144.2084	140.8021	123.6488	116.2057	131.0331	131.9115	149.7082	159.9919	172.3547	(219)	
Water heating fuel used												1765.8995	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1960.4900	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)														
mechanical ventilation fans (SFP = 0.1840)													38.4968	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													113.4968	(231)
Electricity for lighting (calculated in Appendix L)													319.9294	(232)
Total delivered energy for all uses													4159.8157	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1960.4900	3.8700	75.8710 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1765.8995	3.8700	68.3403 (247)
Mechanical ventilation fans	38.4968	18.9000	7.2759 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	319.9294	18.9000	60.4667 (250)
Additional standing charges			93.0000 (251)
Total energy cost			319.1288 (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	1960.4900	0.2160	423.4658 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1765.8995	0.2160	381.4343 (264)
Space and water heating			804.9001 (265)
Pumps and fans	113.4968	0.5190	58.9048 (267)
Energy for lighting	319.9294	0.5190	166.0434 (268)
Total kg/year			1029.8483 (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	1960.4900	1.2200	2391.7978 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1765.8995	1.2200	2154.3974 (264)
Space and water heating			4546.1952 (265)
Pumps and fans	113.4968	3.0700	348.4352 (267)
Energy for lighting	319.9294	3.0700	982.1834 (268)
Primary energy kWh/year			5876.8137 (272)
Primary energy kWh/m2/year			81.2163 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

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

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

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

Fuel prices for cost data on this page from database revision number 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	£82	£82	£0
Mains gas	£237	£237	£0
Space heating	£190	£190	£0
Water heating	£68	£68	£0
Lighting	£60	£60	£0
Total cost of fuels	£319	£319	£0
Total cost of uses	£318	£318	£0
Delivered energy	57 kWh/m²	57 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	81 kWh/m²	81 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	West
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	169.78 (P1)
Transmission heat loss coefficient	56.18 (37)
Summer heat loss coefficient	225.95 (P2)

Overhangs Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
East	0.000	1.000	None
South	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)
East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	4.0600	81.1852	0.4500	0.0000	0.9000	133.4928
East	6.0000	117.5071	0.4500	0.0000	0.9000	285.5422
South	5.2400	112.2060	0.4500	0.0000	0.9000	238.1236
total:						657.1585

	Jun	Jul	Aug	
Solar gains	694	657	595	(P4)
Internal gains	401	384	392	
Total summer gains	1095	1041	987	(P5)
Summer gain/loss ratio	4.85	4.61	4.37	(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	21.10	22.76	22.42	(P7)
Likelihood of high internal temperature	Slight	Medium	Medium	
Assessment of likelihood of high internal temperature:	Medium			