

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025v_097_As_Built				Issued on Date	24/01/2022
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	85 B	DER	15.89	TER	17.67	
Environmental	90 B	% DER<TER	10.08			
CO ₂ Emissions (t/year)	0.71	DFEE	33.83	TFEE	38.31	
General Requirements Compliance	Pass	% DFEE<TFEE	11.69			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 54 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) 17.67 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.29 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	4.25 (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
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6 Controls

Space heating controls:	Programmer, room thermostat and TRVs	OK
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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
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Based on:

Overshading:	Average
Windows facing North:	1.44 m ² , No overhang
Windows facing East:	6.42 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K

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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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (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					4.2500
Number of sides sheltered					0.2125 (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) = 0.1806 (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	0.2303	0.2258	0.2213	0.1987	0.1942	0.1716	0.1716	0.1671	0.1806	0.1942	0.2032	0.2122 (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			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			7.8600	1.2357	9.7129		(27)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-T-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m ²)			50.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.4468		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Floor 1			53.7000				(32d)
Party Ceilings 1			53.7000				(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)							6.4414 (36)
Total fabric heat loss						(33) + (36) =	26.8882 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Average = Sum(39)m / 12 =	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy content (annual)	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (46)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	14.0034	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	43.9111	(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	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	285.4661	283.6496	273.3859	257.0218	240.6859	224.7877	214.3778	219.4146	227.7589	244.2987	263.2452	277.1869	(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			1.4400			10.6334			0.4500			0.0000			0.7700			5.3056 (74)
East			6.4200			19.6403			0.4500			0.0000			0.7700			43.6904 (76)
Solar gains	48.9960	95.6069	157.9822	232.9544	288.8583	297.4445	282.4444	240.1708	184.4166	113.4841	61.0219	40.3519	(83)					
Total gains	334.4621	379.2565	431.3681	489.9762	529.5442	522.2322	496.8223	459.5854	412.1756	357.7828	324.2671	317.5388	(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	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	
alpha	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	
util living area	0.9974	0.9937	0.9797	0.9231	0.7792	0.5805	0.4252	0.4792	0.7535	0.9605	0.9940	0.9981	(86)
MIT	20.1372	20.2696	20.4947	20.7610	20.9355	20.9908	20.9988	20.9976	20.9602	20.7119	20.3638	20.0978	(87)
Th 2	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	(88)
util rest of house	0.9965	0.9917	0.9732	0.9003	0.7284	0.5095	0.3457	0.3943	0.6821	0.9438	0.9918	0.9975	(89)
MIT 2	19.3802	19.5117	19.7331	19.9841	20.1296	20.1663	20.1700	20.1696	20.1498	19.9445	19.6060	19.3410	(90)
Living area fraction	19.6072	19.7389	19.9614	20.2170	20.3712	20.4135	20.4185	20.4179	20.3928	20.1746	19.8332	19.5679	(91)
MIT	19.6072	19.7389	19.9614	20.2170	20.3712	20.4135	20.4185	20.4179	20.3928	20.1746	19.8332	19.5679	(92)
Temperature adjustment	19.4572	19.5889	19.8114	20.0670	20.2212	20.2635	20.2685	20.2679	20.2428	20.0246	19.6832	19.4179	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9956	0.9899	0.9697	0.8971	0.7317	0.5176	0.3552	0.4043	0.6887	0.9402	0.9900	0.9967	(94)
Ext temp.	332.9789	375.4361	418.3177	439.5345	387.4670	270.3174	176.4559	185.8276	283.8801	336.4005	321.0323	316.4966	(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	729.8698	707.3219	640.9903	537.7282	410.3268	272.7175	176.6504	186.2518	295.7953	453.8250	605.9233	732.7952	(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	295.2868	223.0272	165.6684	70.6995	17.0077	0.0000	0.0000	0.0000	0.0000	87.3638	205.1215	309.7261	(98)
Space heating per m ²												1373.9011	(98)
												25.5848	(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													1518.1228	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	295.2868	223.0272	165.6684	70.6995	17.0077	0.0000	0.0000	0.0000	0.0000	87.3638	205.1215	309.7261	(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)	326.2838	246.4389	183.0590	78.1210	18.7931	0.0000	0.0000	0.0000	0.0000	96.5346	226.6536	342.2388	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)	
Efficiency of water heater (217)m	89.4480	89.3396	89.0816	88.5095	87.7198	87.3000	87.3000	87.3000	87.3000	88.6433	89.2584	89.5014	(216)	
Fuel for water heating, kWh/month	155.9629	137.0032	142.8245	126.8052	123.8803	109.0580	102.6852	115.5156	116.2062	131.3998	140.5456	151.4366	(219)	
Water heating fuel used												1553.3233	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1518.1228	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)														
mechanical ventilation fans (SFP = 0.1840)													28.9310	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													103.9310	(231)
Electricity for lighting (calculated in Appendix L)													262.3699	(232)
Total delivered energy for all uses													3437.7470	(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	1518.1228	0.2160	327.9145 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1553.3233	0.2160	335.5178 (264)
Space and water heating			663.4323 (265)
Pumps and fans	103.9310	0.5190	53.9402 (267)
Energy for lighting	262.3699	0.5190	136.1700 (268)
Total CO2, kg/year			853.5425 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.8900 (273)

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

DER		15.8900	ZC1
Total Floor Area		53.7000	
Assumed number of occupants		1.7992	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		17.3061	ZC2
CO2 emissions from cooking, equation (L16)		3.0201	ZC3
Total CO2 emissions		36.2162	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		36.2162	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1552 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4052 (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) =				0.3444 (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												
	0.4391	0.4305	0.4219	0.3788	0.3702	0.3272	0.3272	0.3186	0.3444	0.3702	0.3875	0.4047 (22b)
Effective ac	0.5964	0.5927	0.5890	0.5718	0.5685	0.5535	0.5535	0.5507	0.5593	0.5685	0.5751	0.5819 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.1200	1.0000	2.1200			(26)					
TER Opening Type (Uw = 1.40)			7.8600	1.3258	10.4205			(27)					
WT-E-01	43.5600	7.8600	35.7000	0.1800	6.4260			(29a)					
WT-I-01	7.2200	2.1200	5.1000	0.1800	0.9180			(29a)					
Total net area of external elements Aum(A, m2)			50.7800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.8845			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.2159 (36)					
Total fabric heat loss						(33) + (36) =		25.1004 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 25.3656	Feb 25.2064	Mar 25.0503	Apr 24.3173	May 24.1801	Jun 23.5416	Jul 23.5416	Aug 23.4234	Sep 23.7876	Oct 24.1801	Nov 24.4576	Dec 24.7477	(38)
Heat transfer coeff	50.4660	50.3068	50.1507	49.4176	49.2805	48.6420	48.6420	48.5238	48.8879	49.2805	49.5579	49.8480	(39)
Average = Sum(39)m / 12 =												49.4170	(39)
HLP	Jan 0.9398	Feb 0.9368	Mar 0.9339	Apr 0.9203	May 0.9177	Jun 0.9058	Jul 0.9058	Aug 0.9036	Sep 0.9104	Oct 0.9177	Nov 0.9229	Dec 0.9283	(40)
HLP (average)												0.9202	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	Jan 84.6235	Feb 81.5463	Mar 78.4691	Apr 75.3919	May 72.3146	Jun 69.2374	Jul 69.2374	Aug 72.3146	Sep 75.3919	Oct 78.4691	Nov 81.5463	Dec 84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)												Total = Sum(45)m = 1210.4159 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (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	43.1232	37.5336	39.9870	37.1796	36.8508	34.1445	35.2826	36.8508	37.1796	39.9870	40.2146	43.1232 (61)

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Total heat required for water heating calculated for each month												
	168.6175	147.2917	153.2475	135.9228	131.5972	115.9035	111.0444	123.7885	125.1556	142.5146	152.1315	164.6577 (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												
	168.6175	147.2917	153.2475	135.9228	131.5972	115.9035	111.0444	123.7885	125.1556	142.5146	152.1315	164.6577 (64)
Total per year (kWh/year) = Sum (64)m =												
												1671.8723 (64)
Heat gains from water heating, kWh/month												
	52.5076	45.8780	47.6559	42.1270	40.7159	35.7210	34.0114	38.1195	38.5469	44.0872	47.2660	51.1910 (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	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959 (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)												
	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671 (71)
Water heating gains (Table 5)												
	70.5748	68.2708	64.0536	58.5097	54.7257	49.6125	45.7143	51.2359	53.5374	59.2569	65.6472	68.8051 (72)
Total internal gains												
	295.2483	292.9106	282.1282	265.2468	248.3908	231.9738	221.5688	227.1240	235.9907	253.0478	272.5101	286.9718 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North		1.4400	10.6334	0.6300	0.7000	0.7700	4.6796 (74)
East		6.4200	19.6403	0.6300	0.7000	0.7700	38.5349 (76)
Solar gains							
	43.2145	84.3253	139.3403	205.4658	254.7730	262.3460	249.1160
Total gains							
	338.4627	377.2359	421.4685	470.7126	503.1638	494.3198	470.6848

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												
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	73.8946	74.1285	74.3592	75.4623	75.6723	76.6656	76.6656	76.8524	76.2799	75.6723	75.2486	74.8107
alpha	5.9263	5.9419	5.9573	6.0308	6.0448	6.1110	6.1110	6.1235	6.0853	6.0448	6.0166	5.9874
util living area												
	0.9973	0.9943	0.9833	0.9382	0.8151	0.6154	0.4527	0.5045	0.7783	0.9647	0.9941	0.9980 (86)
MIT												
	20.0812	20.2087	20.4306	20.7147	20.9120	20.9870	20.9983	20.9968	20.9505	20.6862	20.3351	20.0604 (87)
Th 2												
	20.1338	20.1363	20.1388	20.1503	20.1525	20.1626	20.1626	20.1644	20.1587	20.1525	20.1481	20.1435 (88)
util rest of house												
	0.9964	0.9924	0.9778	0.9185	0.7660	0.5410	0.3676	0.4150	0.7073	0.9494	0.9918	0.9973 (89)
MIT 2												
	18.9038	19.0913	19.4138	19.8199	20.0693	20.1542	20.1619	20.1631	20.1206	19.7901	19.2851	18.8808 (90)
Living area fraction												
	19.2568	19.4264	19.7187	20.0882	20.3219	20.4039	20.4127	20.4130	20.3694	20.0587	19.5999	19.2345 (92)
Temperature adjustment												
	19.2568	19.4264	19.7187	20.0882	20.3219	20.4039	20.4127	20.4130	20.3694	20.0587	19.5999	19.2345 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9904	0.9744	0.9169	0.7765	0.5630	0.3932	0.4419	0.7264	0.9473	0.9899	0.9963 (94)
Useful gains	336.8464	373.6105	410.6704	431.5775	390.7253	278.2894	185.0757	193.9790	289.5582	334.5216	323.0293	321.3784 (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												
	754.8097	730.7739	662.9247	552.8924	424.8929	282.3124	185.4554	194.7282	306.4985	466.1317	619.4701	749.4379 (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												
	310.9646	240.0138	187.6772	87.3468	25.4207	0.0000	0.0000	0.0000	0.0000	97.9179	213.4374	318.4763 (98)
Space heating												
												1481.2548 (98)
Space heating per m2												
												27.5839 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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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													1585.9259 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	310.9646	240.0138	187.6772	87.3468	25.4207	0.0000	0.0000	0.0000	0.0000	97.9179	213.4374	318.4763	(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)	332.9386	256.9741	200.9392	93.5190	27.2170	0.0000	0.0000	0.0000	0.0000	104.8372	228.5197	340.9810	(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	168.6175	147.2917	153.2475	135.9228	131.5972	115.9035	111.0444	123.7885	125.1556	142.5146	152.1315	164.6577	(64)
Efficiency of water heater	86.5716	86.2733	85.5625	83.9703	81.7792	80.3000	80.3000	80.3000	80.3000	84.1279	85.9036	86.6841	(217)
Fuel for water heating, kWh/month	194.7723	170.7269	179.1060	161.8702	160.9177	144.3381	138.2869	154.1575	155.8600	169.4022	177.0956	189.9514	(219)
Water heating fuel used												1996.4848	(219)
Annual totals kWh/year													
Space heating fuel - main system												1585.9259	(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)												262.3699	(232)
Total delivered energy for all uses												3919.7806	(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	1585.9259	0.2160	342.5600 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1996.4848	0.2160	431.2407 (264)
Space and water heating			773.8007 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	262.3699	0.5190	136.1700 (268)
Total CO2, kg/m2/year			948.8957 (272)
Emissions per m2 for space and water heating			14.4097 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5358 (272b)
Emissions per m2 for pumps and fans			0.7249 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4097 * 1.00) + 2.5358 + 0.7249, rounded to 2 d.p.			17.6700 (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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1552 (8)
Measured/design AP50					Yes
Infiltration rate					4.2500
Number of sides sheltered					0.3677 (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) =	0.3125 (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												
	0.3985	0.3907	0.3829	0.3438	0.3360	0.2969	0.2969	0.2891	0.3125	0.3360	0.3516	0.3672 (22b)
Effective ac	0.5794	0.5763	0.5733	0.5591	0.5564	0.5441	0.5441	0.5418	0.5488	0.5564	0.5618	0.5674 (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)			7.8600	1.2357	9.7129		(27)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m ²)			50.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.4468		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Floor 1			53.7000				(32d)
Party Ceilings 1			53.7000				(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)							6.4414 (36)
Total fabric heat loss						(33) + (36) =	26.8882 (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	24.6418	24.5106	24.3821	23.7785	23.6655	23.1398	23.1398	23.0424	23.3423	23.6655	23.8940	24.1329 (38)
Heat transfer coeff	51.5300	51.3988	51.2703	50.6667	50.5537	50.0280	50.0280	49.9306	50.2305	50.5537	50.7822	51.0211 (39)
Average = Sum(39)m / 12 =												50.6661 (39)
HLP	0.9596	0.9571	0.9548	0.9435	0.9414	0.9316	0.9316	0.9298	0.9354	0.9414	0.9457	0.9501 (40)
HLP (average)												0.9435 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)										Total = Sum(45)m =		1210.4159 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Heat gains from water heating, kWh/month	26.6675	23.3236	24.0679	20.9829	20.1336	17.3738	16.0994	18.4743	18.6949	21.7871	23.7823	25.8261 (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	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	35.8434	34.7077	32.3493	29.1430	27.0613	24.1303	21.6389	24.8310	25.9651	29.2837	33.0310	34.7125	(72)
Total internal gains	257.5169	256.3475	247.4239	232.8801	217.7264	203.4916	194.4934	197.7192	205.4185	220.0746	236.8938	249.8791	(73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			W
North					1.4400	10.6334	0.4500	0.0000	0.7700			5.3056
East					6.4200	19.6403	0.4500	0.0000	0.7700			43.6904 (74)

Solar gains	48.9960	95.6069	157.9822	232.9544	288.8583	297.4445	282.4444	240.1708	184.4166	113.4841	61.0219	40.3519 (83)
Total gains	306.5129	351.9545	405.4061	465.8344	506.5847	500.9360	476.9378	437.8900	389.8351	333.5587	297.9158	290.2310 (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	72.3689	72.5535	72.7354	73.6020	73.7664	74.5417	74.5417	74.6870	74.2411	73.7664	73.4345	73.0907	
alpha	5.8246	5.8369	5.8490	5.9068	5.9178	5.9694	5.9694	5.9791	5.9494	5.9178	5.8956	5.8727	
util living area	0.9984	0.9961	0.9867	0.9442	0.8217	0.6225	0.4591	0.5192	0.8013	0.9741	0.9964	0.9989	(86)
MIT	19.9954	20.1355	20.3773	20.6852	20.9020	20.9848	20.9979	20.9958	20.9377	20.6349	20.2570	19.9704	(87)
Th 2	20.1171	20.1192	20.1212	20.1307	20.1324	20.1407	20.1407	20.1422	20.1375	20.1324	20.1289	20.1251	(88)
util rest of house	0.9979	0.9948	0.9821	0.9257	0.7726	0.5460	0.3708	0.4252	0.7310	0.9621	0.9950	0.9985	(89)
MIT 2	19.1946	19.3359	19.5768	19.8803	20.0690	20.1340	20.1402	20.1410	20.1042	19.8398	19.4655	19.1764	(90)
Living area fraction									fLA = Living area / (4) =			0.2998	(91)
MIT	19.4347	19.5757	19.8168	20.1216	20.3187	20.3891	20.3973	20.3973	20.3541	20.0782	19.7028	19.4144	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4347	19.5757	19.8168	20.1216	20.3187	20.3891	20.3973	20.3973	20.3541	20.0782	19.7028	19.4144	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9974	0.9937	0.9802	0.9255	0.7839	0.5687	0.3973	0.4535	0.7501	0.9612	0.9941	0.9981	(94)
Ext temp.	305.7038	349.7488	397.3712	431.1358	397.1190	284.8720	189.5012	198.5931	292.4108	320.6188	296.1520	289.6677	(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	779.8904	754.3113	682.7572	568.5619	435.7084	289.6159	189.9715	199.5872	314.1461	479.1575	639.9965	776.2573	(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	352.7948	271.8660	212.3272	98.9468	28.7105	0.0000	0.0000	0.0000	0.0000	117.9528	247.5680	362.0226	(98)
Space heating												1692.1888	(98)
Space heating per m2										(98) / (4) =		31.5119	(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	470.2628	370.2069	379.4725	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9563	0.9815	0.9711	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	449.7091	363.3712	368.5081	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	653.6307	624.3112	579.8163	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	146.8235	194.1393	157.2133	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												498.1762	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled Fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.7059	48.5348	39.3033	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												124.5440 (107)
Space cooling per m2												2.3193 (108)
Energy for space heating												31.5119 (99)
Energy for space cooling												2.3193 (108)
Total												33.8312 (109)
Dwelling Fabric Energy Efficiency (DFEE)												33.8 (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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1552 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4052 (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) = 0.3444 (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												
	0.4391	0.4305	0.4219	0.3788	0.3702	0.3272	0.3272	0.3186	0.3444	0.3702	0.3875	0.4047 (22b)
Effective ac	0.5964	0.5927	0.5890	0.5718	0.5685	0.5535	0.5535	0.5507	0.5593	0.5685	0.5751	0.5819 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.1200	1.0000	2.1200			(26)					
TER Opening Type (Uw = 1.40)			7.8600	1.3258	10.4205			(27)					
WT-E-01	43.5600	7.8600	35.7000	0.1800	6.4260			(29a)					
WT-I-01	7.2200	2.1200	5.1000	0.1800	0.9180			(29a)					
Total net area of external elements Aum(A, m2)			50.7800					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	19.8845		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.2159 (36)					
Total fabric heat loss						(33) + (36) =	25.1004	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 25.3656	Feb 25.2064	Mar 25.0503	Apr 24.3173	May 24.1801	Jun 23.5416	Jul 23.5416	Aug 23.4234	Sep 23.7876	Oct 24.1801	Nov 24.4576	Dec 24.7477	(38)
Heat transfer coeff	50.4660	50.3068	50.1507	49.4176	49.2805	48.6420	48.6420	48.5238	48.8879	49.2805	49.5579	49.8480	(39)
Average = Sum(39)m / 12 =												49.4170	(39)
HLP	Jan 0.9398	Feb 0.9368	Mar 0.9339	Apr 0.9203	May 0.9177	Jun 0.9058	Jul 0.9058	Aug 0.9036	Sep 0.9104	Oct 0.9177	Nov 0.9229	Dec 0.9283	(40)
HLP (average)												0.9202	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)										Total = Sum(45)m =		1210.4159 (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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
26.6675 23.3236 24.0679 20.9829 20.1336 17.3738 16.0994 18.4743 18.6949 21.7871 23.7823 25.8261 (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	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	35.8434	34.7077	32.3493	29.1430	27.0613	24.1303	21.6389	24.8310	25.9651	29.2837	33.0310	34.7125	(72)
Total internal gains	257.5169	256.3475	247.4239	232.8801	217.7264	203.4916	194.4934	197.7192	205.4185	220.0746	236.8938	249.8791	(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					1.4400	10.6334	0.6300	0.7000	0.7700	4.6796		
East					6.4200	19.6403	0.6300	0.7000	0.7700	38.5349 (74)		

Solar gains	43.2145	84.3253	139.3403	205.4658	254.7730	262.3460	249.1160	211.8307	162.6555	100.0930	53.8213	35.5903 (83)
Total gains	300.7314	340.6728	386.7642	438.3458	472.4994	465.8376	443.6094	409.5498	368.0739	320.1675	290.7152	285.4695 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

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	73.8946	74.1285	74.3592	75.4623	75.6723	76.6656	76.6656	76.8524	76.2799	75.6723	75.2486	74.8107	21.0000 (85)
alpha	5.9263	5.9419	5.9573	6.0308	6.0448	6.1110	6.1110	6.1235	6.0853	6.0448	6.0166	5.9874	
util living area	0.9986	0.9966	0.9890	0.9538	0.8446	0.6483	0.4795	0.5389	0.8188	0.9773	0.9968	0.9990	(86)
MIT	20.0135	20.1440	20.3725	20.6717	20.8919	20.9829	20.9976	20.9954	20.9343	20.6355	20.2719	19.9935	(87)
Th 2	20.1338	20.1363	20.1388	20.1503	20.1525	20.1626	20.1626	20.1644	20.1587	20.1525	20.1481	20.1435	(88)
util rest of house	0.9981	0.9955	0.9852	0.9379	0.7988	0.5718	0.3899	0.4442	0.7514	0.9667	0.9955	0.9986	(89)
MIT 2	19.2265	19.3587	19.5872	19.8859	20.0810	20.1549	20.1619	20.1631	20.1228	19.8580	19.4964	19.2146	(90)
Living area fraction	19.4625	19.5942	19.8226	20.1215	20.3241	20.4032	20.4125	20.4126	fLA = Living area / (4) =	20.3661	20.0911	19.7289	0.2998 (91)
MIT	19.4625	19.5942	19.8226	20.1215	20.3241	20.4032	20.4125	20.4126	20.3661	20.0911	19.7289	19.4481	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4625	19.5942	19.8226	20.1215	20.3241	20.4032	20.4125	20.4126	20.3661	20.0911	19.7289	19.4481	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9946	0.9834	0.9372	0.8089	0.5944	0.4169	0.4728	0.7695	0.9657	0.9947	0.9982	(94)
Useful gains	300.0096	338.8236	380.3481	410.8342	382.1834	276.9165	184.9234	193.6274	283.2345	309.1915	289.1641	284.9624	(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	765.1892	739.2168	668.1398	554.5399	425.0013	282.2770	185.4473	194.7087	306.3354	467.7263	625.8624	760.0897	(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	346.0936	269.0642	214.1171	103.4680	31.8565	0.0000	0.0000	0.0000	0.0000	117.9499	242.4228	353.4947	(98)
Space heating												1678.4667	(98)
Space heating per m2												(98) / (4) =	31.2564 (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	457.2348	359.9508	368.7806	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9515	0.9796	0.9689	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	435.0571	352.6196	357.3151	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	612.6065	585.3558	546.6914	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	127.8356	173.1558	140.8960	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												441.8874	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.9589	43.2889	35.2240	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													110.4718 (107)
Space cooling per m2													2.0572 (108)
Energy for space heating													31.2564 (99)
Energy for space cooling													2.0572 (108)
Total													33.3136 (109)
Target Fabric Energy Efficiency (TFEE)													38.3 (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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (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					4.2500
Number of sides sheltered					0.2125 (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) =	0.1806 (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	0.1897	0.1806	0.1806	0.1671	0.1671	0.1490	0.1535	0.1445	0.1490	0.1580	0.1580	0.1716 (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			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			7.8600	1.2357	9.7129		(27)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-T-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m ²)			50.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.4468		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Floor 1			53.7000				(32d)
Party Ceilings 1			53.7000				(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)							6.4414 (36)
Total fabric heat loss						(33) + (36) =	26.8882 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Average = Sum(39)m / 12 =	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy content (annual)	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	14.0034	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	43.9111	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.1412	32.9885	26.8280	20.3105	15.1824	12.8176	13.8499	18.0026	24.1630	30.6805	35.8087	38.1734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.0736	236.5026	230.3817	217.3511	200.9022	185.4427	175.1147	172.6858	178.8066	191.8373	208.2861	223.7457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	418.5852	415.0786	399.0988	374.5241	349.6832	327.2645	314.0658	320.7925	334.8530	359.6034	387.0550	407.5172	(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					1.4400	11.9814	0.4500	0.0000	0.7700	5.9783 (74)		
East					6.4200	22.3313	0.4500	0.0000	0.7700	49.6767 (76)		
Solar gains	55.6549	97.7852	159.5325	241.9742	291.8016	321.3054	301.9062	262.9046	201.7295	123.9279	71.0307	45.3787 (83)
Total gains	474.2401	512.8638	558.6313	616.4983	641.4848	648.5699	615.9719	583.6972	536.5826	483.5313	458.0857	452.8959 (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	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435		
Feb	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629		
Mar	0.9795	0.9658	0.9188	0.7923	0.5899	0.3707	0.2423	0.2639	0.5160	0.8305	0.9562	0.9836	(86)	
Apr	20.4479	20.5485	20.7404	20.9155	20.9875	20.9994	21.0000	20.9999	20.9956	20.9063	20.6553	20.4129	(87)	
May	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	(88)	
Jun	0.9736	0.9564	0.8981	0.7508	0.5327	0.3095	0.1775	0.1955	0.4443	0.7841	0.9423	0.9787	(89)	
Jul	19.6863	19.7832	19.9627	20.1122	20.1638	20.1701	20.1703	20.1703	20.1686	20.1088	19.8872	19.6525	(90)	
Aug	19.9146	20.0127	20.1959	20.3530	20.4108	20.4187	20.4190	20.4190	20.4165	20.3479	20.1175	19.8805	(91)	
Sep	18.7646	19.8627	20.0459	20.2030	20.2608	20.2687	20.2690	20.2690	20.2665	20.1979	19.9675	19.7305	(92)	
Oct														
Nov														
Dec														

8. Space heating requirement

Utilisation	0.9700	0.9522	0.8946	0.7525	0.5391	0.3168	0.1852	0.2037	0.4527	0.7858	0.9382	0.9755	(94)
Useful gains	460.0269	488.3633	499.7623	463.9385	345.8029	205.4362	114.0745	118.8870	242.9338	379.9356	429.7858	441.8041	(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	706.1509	686.7954	608.9419	496.1267	349.6298	205.5542	114.0773	118.8922	243.9713	414.0167	576.2757	704.5060	(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	183.1163	133.3464	81.2296	23.1755	2.8472	0.0000	0.0000	0.0000	0.0000	25.3564	105.4727	195.4502	(98)
Space heating													
RHI space heating demand													

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (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					4.2500
Number of sides sheltered					0.2125 (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) =	0.1806 (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	0.2303	0.2258	0.2213	0.1987	0.1942	0.1716	0.1716	0.1671	0.1806	0.1942	0.2032	0.2122 (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			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			7.8600	1.2357	9.7129		(27)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-T-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m ²)			50.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.4468		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Floor 1			53.7000				(32d)
Party Ceilings 1			53.7000				(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)							6.4414 (36)
Total fabric heat loss						(33) + (36) =	26.8882 (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	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Heat transfer coeff	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534 (39)
Average = Sum(39)m / 12 =												48.1534 (39)
HLP	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967 (40)
HLP (average)												0.8967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)										Total = Sum(45)m =		1210.4159 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (46)

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	14.0034	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	43.9111	(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	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.1412	32.9885	26.8280	20.3105	15.1824	12.8176	13.8499	18.0026	24.1630	30.6805	35.8087	38.1734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.0736	236.5026	230.3817	217.3511	200.9022	185.4427	175.1147	172.6858	178.8066	191.8373	208.2861	223.7457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	418.5852	415.0786	399.0988	374.5241	349.6832	327.2645	314.0658	320.7925	334.8530	359.6034	387.0550	407.5172	(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					1.4400	10.6334	0.4500	0.0000			0.7700	5.3056 (74)
East					6.4200	19.6403	0.4500	0.0000			0.7700	43.6904 (76)

Solar gains	48.9960	95.6069	157.9822	232.9544	288.8583	297.4445	282.4444	240.1708	184.4166	113.4841	61.0219	40.3519 (83)
Total gains	467.5812	510.6856	557.0810	607.4785	638.5415	624.7090	596.5102	560.9634	519.2697	473.0875	448.0769	447.8690 (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	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	
alpha	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	
util living area	0.9849	0.9726	0.9373	0.8418	0.6758	0.4901	0.3548	0.3941	0.6245	0.8836	0.9705	0.9882	(86)
MIT	20.3699	20.4892	20.6772	20.8693	20.9701	20.9963	20.9996	20.9992	20.9854	20.8483	20.5701	20.3282	(87)
Th 2	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	(88)
util rest of house	0.9806	0.9651	0.9212	0.8076	0.6236	0.4280	0.2881	0.3234	0.5557	0.8489	0.9611	0.9848	(89)
MIT 2	19.6098	19.7258	19.9043	20.0747	20.1525	20.1688	20.1702	20.1701	20.1634	20.0616	19.8059	19.5690	(90)
Living area fraction	19.8377	19.9547	20.1360	20.3130	20.3976	20.4169	20.4189	20.4187	20.4098	20.2975	20.0350	19.7966	(92)
Temperature adjustment	19.6877	19.8047	19.9860	20.1630	20.2476	20.2669	20.2689	20.2687	20.2598	20.1475	19.8850	19.6466	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9776	0.9612	0.9171	0.8072	0.6286	0.4353	0.2961	0.3318	0.5633	0.8478	0.9572	0.9821	(94)
Ext temp.	457.0867	490.8666	510.9023	490.3761	401.3898	271.9436	176.5988	186.1497	292.5100	401.0769	428.8923	439.8378	(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	740.9705	717.7105	649.3970	542.3494	411.5980	272.8789	176.6677	186.2892	296.6174	459.7439	615.6422	743.8051	(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 m ²	211.2096	152.4391	103.0401	37.4208	7.5949	0.0000	0.0000	0.0000	0.0000	43.6482	134.4599	226.1517	(98)
												915.9643	(98)
												17.0571	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1012.1153 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	211.2096	152.4391	103.0401	37.4208	7.5949	0.0000	0.0000	0.0000	0.0000	43.6482	134.4599	226.1517	(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)	233.3808	168.4410	113.8564	41.3490	8.3921	0.0000	0.0000	0.0000	0.0000	48.2301	148.5745	249.8914	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Efficiency of water heater (217)m	89.1994	89.0464	88.7035	88.0787	87.5021	87.3000	87.3000	87.3000	87.3000	88.1496	88.9267	89.2737	(216)
Fuel for water heating, kWh/month	156.3975	137.4544	143.4333	127.4254	124.1884	109.0580	102.6852	115.5156	116.2062	132.1358	141.0698	151.8228	(219)
Water heating fuel used												1557.3925	(219)
Annual totals kWh/year													
Space heating fuel - main system												1012.1153	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.9310 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.9310 (231)
Electricity for lighting (calculated in Appendix L)													262.3699 (232)
Total delivered energy for all uses													2935.8087 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1012.1153	3.4800	35.2216 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1557.3925	3.4800	54.1973 (247)
Mechanical ventilation fans	28.9310	13.1900	3.8160 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	262.3699	13.1900	34.6066 (250)
Additional standing charges			120.0000 (251)
Total energy cost			257.7340 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.0967 (257)
SAP value		84.7005
SAP rating (Section 12)		85 (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	1012.1153	0.2160	218.6169 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1557.3925	0.2160	336.3968 (264)
Space and water heating			555.0137 (265)
Pumps and fans	103.9310	0.5190	53.9402 (267)
Energy for lighting	262.3699	0.5190	136.1700 (268)
Total kg/year			745.1239 (272)
CO2 emissions per m2			13.8800 (273)
EI value			89.8838
EI rating			90 (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	$3.48 / 0.8817 = 3.947$, stars = 4
Water heating environmental impact	$0.216 / 0.8817 = 0.2450$, 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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (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	4.2500			
Infiltration rate									0.2125	(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) =	0.1806	(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	0.1897	0.1806	0.1806	0.1671	0.1671	0.1490	0.1535	0.1445	0.1490	0.1580	0.1580	0.1716 (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)			7.8600	1.2357	9.7129		(27)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-T-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m ²)				50.7800			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.4468		(33)
Party Wall 1				21.3600	0.0000	0.0000	(32)
Party Floor 1				53.7000			(32d)
Party Ceilings 1				53.7000			(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)							6.4414 (36)
Total fabric heat loss							(33) + (36) = 26.8882 (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	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Heat transfer coeff	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534	48.1534 (39)
Average = Sum(39)m / 12 =												48.1534 (39)
HLP	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967	0.8967 (40)
HLP (average)												0.8967 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)												Total = Sum(45)m = 1210.4159 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (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	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	14.0034	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	43.9111	(65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)													
Total per year (kWh/year) = Sum(64)m = 1374.6452 (64)													

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	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.1412	32.9885	26.8280	20.3105	15.1824	12.8176	13.8499	18.0026	24.1630	30.6805	35.8087	38.1734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.0736	236.5026	230.3817	217.3511	200.9022	185.4427	175.1147	172.6858	178.8066	191.8373	208.2861	223.7457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	418.5852	415.0786	399.0988	374.5241	349.6832	327.2645	314.0658	320.7925	334.8530	359.6034	387.0550	407.5172	(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	1.4400				11.9814	0.4500	0.0000	0.7700		5.9783 (74)		
East	6.4200				22.3313	0.4500	0.0000	0.7700		49.6767 (76)		

Solar gains	55.6549	97.7852	159.5325	241.9742	291.8016	321.3054	301.9062	262.9046	201.7295	123.9279	71.0307	45.3787 (83)
Total gains	474.2401	512.8638	558.6313	616.4983	641.4848	648.5699	615.9719	583.6972	536.5826	483.5313	458.0857	452.8959 (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	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	77.4435	
alpha	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	6.1629	
util living area	0.9795	0.9658	0.9188	0.7923	0.5899	0.3707	0.2423	0.2639	0.5160	0.8305	0.9562	0.9836	(86)
MIT	20.4479	20.5485	20.7404	20.9155	20.9875	20.9994	21.0000	20.9999	20.9956	20.9063	20.6553	20.4129	(87)
Th 2	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	20.1703	(88)
util rest of house	0.9736	0.9564	0.8981	0.7508	0.5327	0.3095	0.1775	0.1955	0.4443	0.7841	0.9423	0.9787	(89)
MIT 2	19.6863	19.7832	19.9627	20.1122	20.1638	20.1701	20.1703	20.1703	20.1686	20.1088	19.8872	19.6525	(90)
Living area fraction	19.9146	20.0127	20.1959	20.3530	20.4108	20.4187	20.4190	20.4190	20.4165	20.3479	20.1175	19.8805	(92)
Temperature adjustment	19.7646	19.8627	20.0459	20.2030	20.2608	20.2687	20.2690	20.2690	20.2665	20.1979	19.9675	19.7305	(93)
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	460.0269	488.3633	499.7623	463.9385	345.8029	205.4362	114.0745	118.8870	242.9338	379.9356	429.7858	441.8041	(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	706.1509	686.7954	608.9419	496.1267	349.6298	205.5542	114.0773	118.8922	243.9713	414.0167	576.2757	704.5060	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	183.1163	133.3464	81.2296	23.1755	2.8472	0.0000	0.0000	0.0000	0.0000	25.3564	105.4727	195.4502	(98)
Space heating												749.9943	(98)
Space heating per m ²												13.9664	(99)
(98) / (4) =													

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													828.7230 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	183.1163	133.3464	81.2296	23.1755	2.8472	0.0000	0.0000	0.0000	0.0000	25.3564	105.4727	195.4502	(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)	202.3385	147.3440	89.7565	25.6083	3.1461	0.0000	0.0000	0.0000	0.0000	28.0181	116.5444	215.9671	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Efficiency of water heater (217)m	89.0879	88.9397	88.5196	87.8315	87.3789	87.3000	87.3000	87.3000	87.3000	87.8554	88.7331	89.1617	(216)
Fuel for water heating, kWh/month	156.5932	137.6192	143.7312	127.7841	124.3636	109.0580	102.6852	115.5156	116.2062	132.5784	141.3776	152.0136	(219)
Water heating fuel used												1559.5260	(219)
Annual totals kWh/year													
Space heating fuel - main system												828.7230	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.9310 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.9310 (231)
Electricity for lighting (calculated in Appendix L)													262.3699 (232)
Total delivered energy for all uses													2754.5499 (238)

10a. Fuel costs - using BEDF prices (488)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	828.7230	3.6300	30.0826 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1559.5260	3.6300	56.6108 (247)
Mechanical ventilation fans	28.9310	19.4400	5.6242 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	262.3699	19.4400	51.0047 (250)
Additional standing charges			95.0000 (251)
Total energy cost			252.9023 (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	828.7230	0.2160	179.0042 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1559.5260	0.2160	336.8576 (264)
Space and water heating			515.8618 (265)
Pumps and fans	103.9310	0.5190	53.9402 (267)
Energy for lighting	262.3699	0.5190	136.1700 (268)
Total kg/year			705.9719 (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	828.7230	1.2200	1011.0420 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1559.5260	1.2200	1902.6217 (264)
Space and water heating			2913.6637 (265)
Pumps and fans	103.9310	3.0700	319.0681 (267)
Energy for lighting	262.3699	3.0700	805.4757 (268)
Primary energy kWh/year			4038.2075 (272)
Primary energy kWh/m2/year			75.1994 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 90

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

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

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

Potential energy efficiency rating: B 85
 Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 488 TEST (12 Jan 2022)
 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	£71	£71	£0
Mains gas	£182	£182	£0
Space heating	£145	£145	£0
Water heating	£57	£57	£0
Lighting	£51	£51	£0
Total cost of fuels	£253	£253	£0
Total cost of uses	£253	£253	£0
Delivered energy	51 kWh/m²	51 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	75 kWh/m²	75 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) 6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient 255.18 (P1)
 Transmission heat loss coefficient 26.89 (37)
 Summer heat loss coefficient 282.07 (P2)

Overhangs Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
East	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)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Shading	Gains W
North	1.4400	81.1852	0.4500	0.0000	0.9000	47.3472
East	6.4200	117.5071	0.4500	0.0000	0.9000	305.5301
total:						352.8773

	Jun	Jul	Aug	
Solar gains	376	353	307	(P4)
Internal gains	324	311	318	
Total summer gains	700	664	625	(P5)

	2.48	2.35	2.22	
Summer gain/loss ratio	2.48	2.35	2.22	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.73	20.50	20.27	(P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant	

Assessment of likelihood of high internal temperature: Slight