

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026m_107_As_Built				Issued on Date	10/06/2021
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	82 B	DER	20.31	TER	22.33	
Environmental	86 B	% DER<TER	9.03			
CO ₂ Emissions (t/year)	0.93	DFEE	52.06	TFEE	62.75	
General Requirements Compliance	Pass	% DFEE<TFEE	17.03			
Assessor Details	Mr. Robert Price, Robert Price, Tel: 01635 261582, keith@southernenergyconsultants.co.uk				Assessor ID	P865-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Top-floor flat, total floor area 53 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.33 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.31 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 52.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.25 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.28 (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): Slight OK

Based on:

Overshading: Average
Windows facing North: 2.62 m², No overhang
Windows facing East: 5.50 m², No overhang
Windows facing South: 3.80 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

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

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Flat Roof	52.5500		52.5500	0.1500	7.8825		(30)
Total net area of external elements Aum(A, m2)			110.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.6859	(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5152 (36)
Total fabric heat loss						(33) + (36) =	50.2011 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098 (38)
Heat transfer coeff	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109 (39)
Average = Sum(39)m / 12 =												71.0109 (39)
HLP	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513 (40)
HLP (average)												1.3513 (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												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)												Total = Sum(45)m = 1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (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	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	0.0000	(57)
Combi loss	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983	13.9983	(61)
Total heat required for water heating calculated for each month	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	134.2614	(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	0.0000	(63)
Output from w/h	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	134.2614	(64)
Heat gains from water heating, kWh/month	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871	43.4871	(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	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7133	12.1800	9.9054	7.4991	5.6056	4.7325	5.1136	6.6469	8.9215	11.3279	13.2213	14.0944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	(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)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	280.2488	278.5479	268.5905	252.6454	236.7108	221.1302	210.8608	215.7482	223.8064	239.9253	258.4432	272.0878	(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					2.6200	10.6334	0.4500	0.0000	0.7700		9.6533 (74)	
East					5.5000	19.6403	0.4500	0.0000	0.7700		37.4294 (76)	
South					3.8000	46.7521	0.4500	0.0000	0.7700		61.5584 (78)	

Solar gains	108.6412	192.4848	280.3532	371.3607	434.6063	438.8011	420.0614	372.3287	312.0855	217.5819	131.5465	92.0198 (83)
Total gains	388.8900	471.0327	548.9437	624.0062	671.3172	659.9313	630.9222	588.0769	535.8919	457.5072	389.9896	364.1076 (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	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	
alpha	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	
util living area	0.9510	0.9243	0.8805	0.8056	0.6975	0.5649	0.4431	0.4844	0.6712	0.8473	0.9300	0.9575	(86)
MIT	18.4066	18.7503	19.2638	19.8669	20.3893	20.7404	20.8955	20.8672	20.5860	19.8849	19.0157	18.3166	(87)
Th 2	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	(88)
util rest of house	0.9434	0.9128	0.8622	0.7747	0.6473	0.4871	0.3391	0.3798	0.6000	0.8158	0.9173	0.9508	(89)
MIT 2	17.4686	17.8045	18.3033	18.8772	19.3538	19.6488	19.7584	19.7431	19.5362	18.9105	18.0715	17.3803	(90)
Living area fraction									fLA = Living area / (4) =			0.4472	(91)
MIT	17.8881	18.2275	18.7328	19.3198	19.8169	20.1370	20.2669	20.2458	20.0056	19.3463	18.4937	17.7990	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.7381	18.0775	18.5828	19.1698	19.6669	19.9870	20.1169	20.0958	19.8556	19.1963	18.3437	17.6490	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	360.0480	420.0204	460.7777	471.6971	430.4102	330.0328	232.1945	239.4620	323.4759	364.4341	349.9060	340.2725	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	954.2490	935.7438	858.0124	729.2660	565.7353	382.5338	249.7378	262.4419	408.7124	610.4288	798.4276	955.0277	(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	442.0856	346.5661	295.5426	185.4496	100.6819	0.0000	0.0000	0.0000	0.0000	183.0201	322.9356	457.3779	(98)
Space heating												2333.6593	(98)
Space heating per m ²												(98) / (4) =	44.4084 (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													2578.6290 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	442.0856	346.5661	295.5426	185.4496	100.6819	0.0000	0.0000	0.0000	0.0000	183.0201	322.9356	457.3779	(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)	488.4924	382.9460	326.5664	204.9167	111.2507	0.0000	0.0000	0.0000	0.0000	202.2321	356.8349	505.3900	(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	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
Efficiency of water heater (217)m	89.7168	89.6483	89.5190	89.2734	88.8176	87.3000	87.3000	87.3000	87.3000	89.2351	89.5875	87.3000	(216)
Fuel for water heating, kWh/month	154.0264	135.2457	140.7982	124.5591	121.2294	108.0751	101.7744	114.4703	115.1482	129.3221	138.7174	149.5892	(219)
Water heating fuel used												1532.9556	(219)
Annual totals kWh/year													
Space heating fuel - main system												2578.6290	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.3114 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.3114 (231)
Electricity for lighting (calculated in Appendix L)													242.1807 (232)
Total delivered energy for all uses													4457.0768 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year	
Space heating - main system 1	2578.6290	0.2160	556.9839	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1532.9556	0.2160	331.1184	(264)
Space and water heating			888.1023	(265)
Pumps and fans	103.3114	0.5190	53.6186	(267)
Energy for lighting	242.1807	0.5190	125.6918	(268)
Total CO ₂ , kg/year			1067.4127	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.3100	(273)

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

DER			20.3100	ZC1
Total Floor Area		TFA	52.5500	
Assumed number of occupants		N	1.7653	
CO ₂ emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO ₂ emissions from appliances, equation (L14)			17.3491	ZC2
CO ₂ emissions from cooking, equation (L16)			3.0707	ZC3
Total CO ₂ emissions			40.7298	ZC4
Residual CO ₂ emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO ₂ emissions			40.7298	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	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1586 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4086 (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) =				0.3473 (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	0.4428	0.4341	0.4254	0.3820	0.3733	0.3299	0.3299	0.3212	0.3473	0.3733	0.3907	0.4081 (22b)
	0.5980	0.5942	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			11.0100	1.3258	14.5966		(27)
WT-E-03	50.2300	11.0100	39.2200	0.1800	7.0596		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1800	0.9360		(29a)
Flat Roof	52.5500		52.5500	0.1300	6.8315		(30)
Total net area of external elements Aum, m ²			110.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5437		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.4675 (36)
Total fabric heat loss						(33) + (36) =	48.0112 (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	24.8900	24.7315	24.5762	23.8468	23.7103	23.0750	23.0750	22.9573	23.3197	23.7103	23.9864	24.2750 (38)
Heat transfer coeff	72.9012	72.7427	72.5874	71.8580	71.7215	71.0862	71.0862	70.9685	71.3309	71.7215	71.9976	72.2862 (39)
Average = Sum(39)m / 12 =												71.8573 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3873	1.3843	1.3813	1.3674	1.3648	1.3527	1.3527	1.3505	1.3574	1.3648	1.3701	1.3756 (40)
HLP (average)												1.3674 (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												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	42.6721	37.1410	39.5687	36.7906	36.4653	33.7873	34.9136	36.4653	36.7906	39.5687	39.7939	42.6721 (61)
Total heat required for water heating calculated for each month	166.8536	145.7509	151.6444	134.5010	130.2207	114.6911	109.8828	122.4936	123.8464	141.0238	150.5401	162.9353 (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	166.8536	145.7509	151.6444	134.5010	130.2207	114.6911	109.8828	122.4936	123.8464	141.0238	150.5401	162.9353 (64)
Heat gains from water heating, kWh/month	51.9584	45.3981	47.1574	41.6863	40.2900	35.3473	33.6557	37.7207	38.1437	43.6260	46.7716	50.6555 (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	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7559	12.2179	9.9362	7.5224	5.6231	4.7472	5.1295	6.6676	8.9492	11.3631	13.2624	14.1382 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265 (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)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118 (71)
Water heating gains (Table 5)	69.8365	67.5566	63.3835	57.8977	54.1532	49.0935	45.2361	50.6999	52.9774	58.6371	64.9605	68.0854 (72)
Total internal gains	289.9238	287.7024	277.2245	260.7600	244.3047	228.2079	217.9445	223.3498	231.9320	248.5704	267.6047	281.7666 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	2.4200	10.6334	0.6300		0.7000	0.7700	7.8643 (74)
East	5.0800	19.6403	0.6300		0.7000	0.7700	30.4918 (76)
South	3.5100	46.7521	0.6300		0.7000	0.7700	50.1510 (78)

Solar gains	88.5071	156.8119	228.3951	302.5354	354.0589	357.4760	342.2095	303.3237	254.2462	177.2577	107.1673	74.9661 (83)
Total gains	378.4309	444.5143	505.6197	563.2954	598.3637	585.6839	560.1540	526.6735	486.1782	425.8281	374.7720	356.7327 (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	50.0583	50.1673	50.2746	50.7850	50.8816	51.3364	51.3364	51.4215	51.1602	50.8816	50.6865	50.4841
alpha	4.3372	4.3445	4.3516	4.3857	4.3921	4.4224	4.4224	4.4281	4.4107	4.3921	4.3791	4.3656
util living area	0.9957	0.9907	0.9782	0.9419	0.8559	0.7007	0.5388	0.5892	0.8201	0.9615	0.9915	0.9966 (86)
MIT	19.5598	19.7474	20.0432	20.4174	20.7336	20.9232	20.9811	20.9722	20.8391	20.4213	19.9189	19.5256 (87)
Th 2	19.7731	19.7754	19.7777	19.7884	19.7904	19.7998	19.7998	19.8015	19.7962	19.7904	19.7863	19.7821 (88)
util rest of house	0.9942	0.9875	0.9704	0.9201	0.8018	0.5980	0.4015	0.4504	0.7356	0.9426	0.9880	0.9955 (89)
MIT 2	17.8868	18.1609	18.5892	19.1234	19.5373	19.7508	19.7934	19.7909	19.6734	19.1411	18.4195	17.8430 (90)
Living area fraction	18.6349	18.8704	19.2394	19.7020	20.0723	20.2751	20.3245	20.3192	20.1947	19.7136	19.0900	18.5954 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6349	18.8704	19.2394	19.7020	20.0723	20.2751	20.3245	20.3192	20.1947	19.7136	19.0900	18.5954 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9922	0.9843	0.9659	0.9182	0.8160	0.6413	0.4634	0.5129	0.7669	0.9411	0.9852	0.9938 (94)
Ext temp.	375.4708	437.5451	488.3732	517.2337	488.2494	375.5909	259.5953	270.1194	372.8666	400.7411	369.2189	354.5364 (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	1045.0343	1016.2457	924.7227	776.2130	600.4733	403.4190	264.7618	278.1374	434.7375	653.6424	863.2508	1040.5918 (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	498.1553	388.8868	324.6441	186.4651	83.4946	0.0000	0.0000	0.0000	0.0000	188.1586	355.7030	510.4252 (98)
												2535.9326 (98)
												48.2575 (99)

8c. Space cooling requirement

Not applicable

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

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Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2715.1312 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	498.1553	388.8868	324.6441	186.4651	83.4946	0.0000	0.0000	0.0000	0.0000	188.1586	355.7030	510.4252	(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)	533.3568	416.3670	347.5846	199.6414	89.3947	0.0000	0.0000	0.0000	0.0000	201.4546	380.8383	546.4937	(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	166.8536	145.7509	151.6444	134.5010	130.2207	114.6911	109.8828	122.4936	123.8464	141.0238	150.5401	162.9353	(64)
Efficiency of water heater	87.6344	87.4030	86.9192	85.8738	83.9650	80.3000	80.3000	80.3000	80.3000	85.7779	87.1407	87.7299	(216)
Fuel for water heating, kWh/month	190.3974	166.7573	174.4659	156.6263	155.0892	142.8282	136.8403	152.5449	154.2296	164.4057	172.7551	185.7237	(219)
Water heating fuel used												1952.6638	(219)
Annual totals kWh/year													
Space heating fuel - main system												2715.1312	(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)												242.9334	(232)
Total delivered energy for all uses												4985.7284	(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	2715.1312	0.2160	586.4683 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1952.6638	0.2160	421.7754 (264)
Space and water heating			1008.2437 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	242.9334	0.5190	126.0824 (268)
Total CO2, kg/m2/year			1173.2512 (272)
Emissions per m2 for space and water heating			19.1864 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3993 (272b)
Emissions per m2 for pumps and fans			0.7407 (272c)
Target Carbon Dioxide Emission Rate (TER) = (19.1864 * 1.00) + 2.3993 + 0.7407, rounded to 2 d.p.			22.3300 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1586 (8)
Measured/design AP50					Yes
Infiltration rate					3.2800
Number of sides sheltered					0.3226 (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) =				0.2742 (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												
	0.3496	0.3427	0.3359	0.3016	0.2948	0.2605	0.2605	0.2536	0.2742	0.2948	0.3085	0.3222 (22b)
Effective ac	0.5611	0.5587	0.5564	0.5455	0.5434	0.5339	0.5339	0.5322	0.5376	0.5434	0.5476	0.5519 (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)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Flat Roof	52.5500		52.5500	0.1500	7.8825		(30)
Total net area of external elements Aum, m ²			110.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 31.6859		(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5152 (36)
Total fabric heat loss						(33) + (36) =	50.2011 (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	23.3531	23.2543	23.1575	22.7029	22.6178	22.2218	22.2218	22.1484	22.3743	22.6178	22.7899	22.9698 (38)
Heat transfer coeff	73.5542	73.4555	73.3587	72.9040	72.8189	72.4229	72.4229	72.3496	72.5754	72.8189	72.9910	73.1709 (39)
Average = Sum(39)m / 12 =												72.9036 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3997	1.3978	1.3960	1.3873	1.3857	1.3782	1.3782	1.3768	1.3811	1.3857	1.3890	1.3924 (40)
HLP (average)												1.3873 (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												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (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	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	26.3886	23.0796	23.8161	20.7634	19.9230	17.1921	15.9310	18.2810	18.4993	21.5592	23.5336	25.5559 (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	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7133	12.1800	9.9054	7.4991	5.6056	4.7325	5.1136	6.6469	8.9215	11.3279	13.2213	14.0944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	(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)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	35.4685	34.3447	32.0109	28.8381	26.7783	23.8778	21.4126	24.5713	25.6935	28.9774	32.6855	34.3494	(72)
Total internal gains	252.5132	251.4525	242.8211	228.6771	213.9124	199.9776	191.1051	194.2005	201.6205	215.8755	232.2885	244.9868	(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	2.6200	10.6334	0.4500	0.0000	0.7700	9.6533	(74)
East	5.5000	19.6403	0.4500	0.0000	0.7700	37.4294	(76)
South	3.8000	46.7521	0.4500	0.0000	0.7700	61.5584	(78)

Solar gains	108.6412	192.4848	280.3532	371.3607	434.6063	438.8011	420.0614	372.3287	312.0855	217.5819	131.5465	92.0198	(83)
Total gains	361.1543	443.9373	523.1743	600.0379	648.5187	638.7786	611.1664	566.5292	513.7060	433.4575	363.8350	337.0066	(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	19.8455	19.8722	19.8984	20.0225	20.0459	20.1555	20.1555	20.1760	20.1132	20.0459	19.9987	19.9495	
alpha	2.3230	2.3248	2.3266	2.3348	2.3364	2.3437	2.3437	2.3451	2.3409	2.3364	2.3332	2.3300	
util living area	0.9582	0.9334	0.8923	0.8202	0.7153	0.5829	0.4602	0.5037	0.6917	0.8625	0.9394	0.9639	(86)
MIT	18.2392	18.5947	19.1302	19.7749	20.3295	20.7128	20.8822	20.8505	20.5422	19.7948	18.8876	18.1634	(87)
Th 2	19.7636	19.7650	19.7664	19.7731	19.7743	19.7801	19.7801	19.7812	19.7779	19.7743	19.7718	19.7692	(88)
util rest of house	0.9514	0.9229	0.8750	0.7903	0.6653	0.5035	0.3520	0.3954	0.6204	0.8327	0.9280	0.9580	(89)
MIT 2	17.2797	17.6291	18.1518	18.7725	19.2823	19.6115	19.7324	19.7161	19.4840	18.8090	17.9278	17.2088	(90)
Living area fraction	17.7088	18.0609	18.5893	19.2208	19.7506	20.1040	20.2466	20.2234	fLA = Living area / (4) =	19.9572	19.2498	18.3570	0.4472 (91)
MIT	17.7088	18.0609	18.5893	19.2208	19.7506	20.1040	20.2466	20.2234	19.9572	19.2498	18.3570	17.6357	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7088	18.0609	18.5893	19.2208	19.7506	20.1040	20.2466	20.2234	19.9572	19.2498	18.3570	17.6357	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9363	0.9042	0.8548	0.7747	0.6642	0.5261	0.3956	0.4371	0.6320	0.8172	0.9108	0.9442	(94)
Useful gains	338.1505	401.4218	447.2050	464.8205	430.7462	336.0607	241.7562	247.6337	324.6741	354.2416	331.3880	318.1935	(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	986.2753	966.7384	886.8555	752.4260	586.2364	398.6154	264.0954	276.6208	425.0895	629.8699	821.6629	983.1039	(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	482.2049	379.8927	327.1000	207.0759	115.6847	0.0000	0.0000	0.0000	0.0000	205.0675	352.9979	494.6933	(98)
Space heating												2564.7170	(98)
Space heating per m2											(98) / (4) =	48.8053	(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	680.7752	535.9294	549.8566	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7604	0.8182	0.7921	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	517.6465	438.5193	435.5291	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	813.1785	779.6306	728.4483	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	212.7830	253.7868	217.9318	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												684.5017 (104)
Cooled Fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	53.1958	63.4467	54.4830	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												171.1254 (107)
Space cooling per m2												3.2564 (108)
Energy for space heating												48.8053 (99)
Energy for space cooling												3.2564 (108)
Total												52.0617 (109)
Dwelling Fabric Energy Efficiency (DFEE)												52.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (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) = 0.1586 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4086 (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) =	0.3473 (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	0.4428	0.4341	0.4254	0.3820	0.3733	0.3299	0.3299	0.3212	0.3473	0.3733	0.3907	0.4081 (22b)
	0.5980	0.5942	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			11.0100	1.3258	14.5966		(27)
WT-E-03	50.2300	11.0100	39.2200	0.1800	7.0596		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1800	0.9360		(29a)
Flat Roof	52.5500		52.5500	0.1300	6.8315		(30)
Total net area of external elements Aum, m ²			110.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5437		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.4675 (36)
Total fabric heat loss						(33) + (36) =	48.0112 (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	24.8900	24.7315	24.5762	23.8468	23.7103	23.0750	23.0750	22.9573	23.3197	23.7103	23.9864	24.2750 (38)
Heat transfer coeff	72.9012	72.7427	72.5874	71.8580	71.7215	71.0862	71.0862	70.9685	71.3309	71.7215	71.9976	72.2862 (39)
Average = Sum(39)m / 12 =												71.8573 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3873	1.3843	1.3813	1.3674	1.3648	1.3527	1.3527	1.3505	1.3574	1.3648	1.3701	1.3756 (40)
HLP (average)												1.3674 (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												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (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)

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	26.3886	23.0796	23.8161	20.7634	19.9230	17.1921	15.9310	18.2810	18.4993	21.5592	23.5336	25.5559 (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	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7559	12.2179	9.9362	7.5224	5.6231	4.7472	5.1295	6.6676	8.9492	11.3631	13.2624	14.1382	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	(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)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	35.4685	34.3447	32.0109	28.8381	26.7783	23.8778	21.4126	24.5713	25.6935	28.9774	32.6855	34.3494	(72)
Total internal gains	252.5558	251.4904	242.8519	228.7005	213.9298	199.9923	191.1210	194.2212	201.6482	215.9107	232.3296	245.0306	(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	2.4200	10.6334	0.6300	0.7000	0.7700	7.8643 (74)
East	5.0800	19.6403	0.6300	0.7000	0.7700	30.4918 (76)
South	3.5100	46.7521	0.6300	0.7000	0.7700	50.1510 (78)

Solar gains	88.5071	156.8119	228.3951	302.5354	354.0589	357.4760	342.2095	303.3237	254.2462	177.2577	107.1673	74.9661	(83)
Total gains	341.0629	408.3023	471.2470	531.2358	567.9887	557.4683	533.3305	497.5449	455.8944	393.1684	339.4969	319.9967	(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	50.0583	50.1673	50.2746	50.7850	50.8816	51.3364	51.3364	51.4215	51.1602	50.8816	50.6865	50.4841	
alpha	4.3372	4.3445	4.3516	4.3857	4.3921	4.4224	4.4224	4.4281	4.4107	4.3921	4.3791	4.3656	
util living area	0.9971	0.9933	0.9830	0.9518	0.8735	0.7246	0.5622	0.6173	0.8450	0.9707	0.9942	0.9978	(86)
MIT	19.4969	19.6877	19.9895	20.3745	20.7062	20.9121	20.9777	20.9667	20.8158	20.3735	19.8603	19.4634	(87)
Th 2	19.7731	19.7754	19.7777	19.7884	19.7904	19.7998	19.7998	19.8015	19.7962	19.7904	19.7863	19.7821	(88)
util rest of house	0.9961	0.9909	0.9768	0.9329	0.8231	0.6224	0.4208	0.4748	0.7654	0.9555	0.9917	0.9971	(89)
MIT 2	18.4227	18.6142	18.9143	19.2953	19.5965	19.7607	19.7945	19.7926	19.6974	19.3029	18.7954	18.3962	(90)
Living area fraction									fLA = Living area / (4) =			0.4472	(91)
MIT	18.9031	19.0943	19.3951	19.7779	20.0928	20.2756	20.3236	20.3176	20.1975	19.7817	19.2716	18.8735	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9031	19.0943	19.3951	19.7779	20.0928	20.2756	20.3236	20.3176	20.1975	19.7817	19.2716	18.8735	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	339.3955	403.8866	459.1289	495.4852	475.6256	371.1912	258.5436	268.2923	362.6675	375.6368	336.2068	318.8004	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1064.5817	1032.5301	936.0205	781.6647	601.9410	403.4550	264.6990	278.0288	434.9422	658.5227	876.3287	1060.6898	(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	539.5385	422.4485	354.8073	206.0492	93.9786	0.0000	0.0000	0.0000	0.0000	210.4671	388.8877	551.9657	(98)
Space heating												2768.1427	(98)
Space heating per m2										(98) / (4) =		52.6764	(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	668.2101	526.0378	539.3608	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8437	0.9066	0.8820	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.7807	476.8926	475.7021	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	718.1600	688.6747	647.8447	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	111.1531	157.5659	128.0741	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												396.7931	(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	27.7883	39.3915	32.0185	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											99.1983 (107)
Space cooling per m2											1.8877 (108)
Energy for space heating											52.6764 (99)
Energy for space cooling											1.8877 (108)
Total											54.5641 (109)
Target Fabric Energy Efficiency (TFEE)											62.7 (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	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (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			2.1200	1.0000	2.1200			(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300			(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296			(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1584	0.8238			(29a)
Flat Roof	52.5500		52.5500	0.1500	7.8825			(30)
Total net area of external elements Aum(A, m2)			110.1000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	31.6859		(33)
Party Wall 1			20.8800	0.0000	0.0000			(32)
Party Floor 1			52.5500					(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								18.5152 (36)
Total fabric heat loss						(33) + (36) =	50.2011 (37)	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
Daily hot water use	Jan 83.7383	Feb 80.6933	Mar 77.6483	Apr 74.6032	May 71.5582	Jun 68.5132	Jul 68.5132	Aug 71.5582	Sep 74.6032	Oct 77.6483	Nov 80.6933	Dec 83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)												Total = Sum(45)m = 1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (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	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983	(61)
Total heat required for water heating calculated for each month	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(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	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2832	30.4500	24.7636	18.7477	14.0141	11.8313	12.7841	16.6173	22.3037	28.3197	33.0532	35.2360	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.6298	232.0126	226.0080	213.2247	197.0882	181.9221	171.7902	169.4074	175.4120	188.1953	204.3318	219.4979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	(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)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	409.7801	406.5656	391.2148	367.4417	343.3419	321.4468	308.4056	314.8065	328.2581	352.2051	378.8882	398.8472	(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				2.6200	11.9814	0.4500	0.0000	0.7700	10.8771 (74)			
East				5.5000	22.3313	0.4500	0.0000	0.7700	42.5579 (76)			
South				3.8000	50.9848	0.4500	0.0000	0.7700	67.1317 (78)			
Solar gains	120.5667	192.4263	277.5571	380.3235	434.9712	470.5999	445.3831	402.7065	335.3901	232.4293	149.5975	101.1139 (83)
Total gains	530.3468	598.9920	668.7719	747.7652	778.3131	792.0467	753.7887	717.5130	663.6482	584.6344	528.4856	499.9611 (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	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563		
alpha	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704		
util living area	0.9040	0.8750	0.8188	0.7216	0.5870	0.4087	0.2807	0.3022	0.5256	0.7484	0.8655	0.9137	(86)	
MIT	18.9355	19.1902	19.6710	20.2098	20.6465	20.9004	20.9728	20.9670	20.7996	20.2691	19.5199	18.8634	(87)	
Th 2	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	(88)	
util rest of house	0.8900	0.8572	0.7927	0.6813	0.5255	0.3228	0.1766	0.1946	0.4410	0.7019	0.8430	0.9007	(89)	
MIT 2	17.9832	18.2279	18.6871	19.1856	19.5659	19.7556	19.7949	19.7930	19.6927	19.2543	18.5535	17.9143	(90)	
Living area fraction									fLA =	Living area / (4) =			0.4472	(91)
MIT	18.4091	18.6582	19.1271	19.6436	20.0491	20.2675	20.3216	20.3180	20.1877	19.7081	18.9856	18.3388	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	18.2591	18.5082	18.9771	19.4936	19.8991	20.1175	20.1716	20.1680	20.0377	19.5581	18.8356	18.1888	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	460.0296	499.5832	516.2292	500.9307	413.2036	274.3864	158.0125	163.9927	304.4956	404.1389	433.8823	439.3316	(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	934.4368	916.6248	822.0992	681.2528	489.9133	292.3904	161.3108	168.1553	343.5273	565.1114	769.4482	929.4454	(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	352.9590	280.2520	227.5673	129.8319	57.0720	0.0000	0.0000	0.0000	0.0000	119.7635	241.6075	364.6447	(98)
Space heating												1773.6978	(98)
RHI space heating demand												1774	(98)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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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	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Flat Roof	52.5500		52.5500	0.1500	7.8825		(30)
Total net area of external elements Aum(A, m2)			110.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6859		(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5152 (36)
Total fabric heat loss							(33) + (36) = 50.2011 (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	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098 (38)
Average = Sum(39)m / 12 =	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109	71.0109 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513	1.3513 (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												
Average daily hot water use (litres/day)												1.7653 (42)
												76.1257 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy content (annual)	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1197.7543 (45)
	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (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	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983	(61)
Total heat required for water heating calculated for each month	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(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	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
Heat gains from water heating, kWh/month	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871	(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	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2832	30.4500	24.7636	18.7477	14.0141	11.8313	12.7841	16.6173	22.3037	28.3197	33.0532	35.2360	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.6298	232.0126	226.0080	213.2247	197.0882	181.9221	171.7902	169.4074	175.4120	188.1953	204.3318	219.4979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	(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)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	409.7801	406.5656	391.2148	367.4417	343.3419	321.4468	308.4056	314.8065	328.2581	352.2051	378.8882	398.8472	(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				2.6200	10.6334	0.4500	0.0000	0.7700	9.6533 (74)			
East				5.5000	19.6403	0.4500	0.0000	0.7700	37.4294 (76)			
South				3.8000	46.7521	0.4500	0.0000	0.7700	61.5584 (78)			
Solar gains	108.6412	192.4848	280.3532	371.3607	434.6063	438.8011	420.0614	372.3287	312.0855	217.5819	131.5465	92.0198 (83)
Total gains	518.4212	599.0504	671.5680	738.8025	777.9482	760.2479	728.4669	687.1352	640.3436	569.7870	510.4346	490.8670 (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	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563		
alpha	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704		
util living area	0.9156	0.8840	0.8345	0.7543	0.6439	0.5116	0.3940	0.4288	0.6049	0.7880	0.8866	0.9245	(86)	
MIT	18.7398	19.0496	19.5088	20.0405	20.4931	20.7916	20.9191	20.8983	20.6737	20.0799	19.3013	18.6508	(87)	
Th 2	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	(88)	
util rest of house	0.9036	0.8680	0.8115	0.7195	0.5919	0.4363	0.2982	0.3318	0.5325	0.7498	0.8680	0.9136	(89)	
MIT 2	17.7914	18.0905	18.5312	19.0302	19.4361	19.6814	19.7688	19.7579	19.5980	19.0821	18.3427	17.7053	(90)	
Living area fraction									fLA = Living area / (4) =			0.4472	(91)	
MIT	18.2155	18.5194	18.9684	19.4820	19.9088	20.1779	20.2832	20.2678	20.0791	19.5283	18.7713	18.1281	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	18.0655	18.3694	18.8184	19.3320	19.7588	20.0279	20.1332	20.1178	19.9291	19.3783	18.6213	17.9781	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8816	0.8446	0.7895	0.7042	0.5899	0.4514	0.3259	0.3587	0.5409	0.7342	0.8456	0.8923	(94)
Useful gains	457.0363	505.9866	530.1991	520.2963	458.9296	343.1781	237.3772	246.4705	346.3753	418.3388	431.6183	438.0115	(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	977.5006	956.4730	874.7393	740.7847	572.2595	385.4386	250.8961	264.0071	413.9289	623.3569	818.1411	978.3963	(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	387.2254	302.7268	256.3379	158.7517	84.3175	0.0000	0.0000	0.0000	0.0000	152.5335	278.2964	402.0463	(98)
Space heating												2022.2356	(98)
Space heating per m2											(98) / (4) =	38.4821	(99)

8c. Space cooling requirement

Not applicable

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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													2234.5144	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	387.2254	302.7268	256.3379	158.7517	84.3175	0.0000	0.0000	0.0000	0.0000	152.5335	278.2964	402.0463	(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)	427.8734	334.5048	283.2463	175.4162	93.1685	0.0000	0.0000	0.0000	0.0000	168.5453	307.5098	444.2501	(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	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)	
Efficiency of water heater	89.6359	89.5612	89.4196	89.1539	88.6771	87.3000	87.3000	87.3000	87.3000	89.0934	89.4874	87.3000	(216)	
(217)m	89.6359	89.5612	89.4196	89.1539	88.6771	87.3000	87.3000	87.3000	87.3000	89.0934	89.4874	89.6771	(217)	
Fuel for water heating, kWh/month	154.1656	135.3774	140.9547	124.7260	121.4214	108.0751	101.7744	114.4703	115.1482	129.5277	138.8725	149.7165	(219)	
Water heating fuel used												1534.2300	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2234.5144	(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)												28.3114	(230a)	
central heating pump												30.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												103.3114	(231)	
Electricity for lighting (calculated in Appendix L)												242.1807	(232)	
Total delivered energy for all uses												4114.2366	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2234.5144	3.4800	77.7611 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1534.2300	3.4800	53.3912 (247)
Mechanical ventilation fans	28.3114	13.1900	3.7343 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	242.1807	13.1900	31.9436 (250)
Additional standing charges			120.0000 (251)
Total energy cost			296.7227 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	1.2775 (257)
SAP value	82.1784
SAP rating (Section 12)	82 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2234.5144	0.2160	482.6551 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1534.2300	0.2160	331.3937 (264)
Space and water heating			814.0488 (265)
Pumps and fans	103.3114	0.5190	53.6186 (267)
Energy for lighting	242.1807	0.5190	125.6918 (268)
Total kg/year			993.3592 (272)
CO2 emissions per m2			18.9000 (273)
EI value			86.3547
EI rating			86 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8866 = 3.925$, stars = 4
Water heating environmental impact	$0.216 / 0.8866 = 0.2436$, 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	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Flat Roof	52.5500		52.5500	0.1500	7.8825		(30)
Total net area of external elements Aum(A, m2)			110.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	31.6859	(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.5152 (36)
Total fabric heat loss							(33) + (36) = 50.2011 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7653 (42)
Average daily hot water use (litres/day)													76.1257 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)												Total = Sum(45)m = 1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (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	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983	(61)
Total heat required for water heating calculated for each month	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(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	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
Heat gains from water heating, kWh/month	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871	(65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)													
Total per year (kWh/year) = Sum(64)m = 1361.9366 (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	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2832	30.4500	24.7636	18.7477	14.0141	11.8313	12.7841	16.6173	22.3037	28.3197	33.0532	35.2360	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.6298	232.0126	226.0080	213.2247	197.0882	181.9221	171.7902	169.4074	175.4120	188.1953	204.3318	219.4979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	(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)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	409.7801	406.5656	391.2148	367.4417	343.3419	321.4468	308.4056	314.8065	328.2581	352.2051	378.8882	398.8472	(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				2.6200	11.9814	0.4500	0.0000			0.7700			10.8771 (74)
East				5.5000	22.3313	0.4500	0.0000			0.7700			42.5579 (76)
South				3.8000	50.9848	0.4500	0.0000			0.7700			67.1317 (78)
Solar gains	120.5667	192.4263	277.5571	380.3235	434.9712	470.5999	445.3831	402.7065	335.3901	232.4293	149.5975	101.1139	(83)
Total gains	530.3468	598.9920	668.7719	747.7652	778.3131	792.0467	753.7887	717.5130	663.6482	584.6344	528.4856	499.9611	(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	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	20.5563	
alpha	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	2.3704	
util living area	0.9040	0.8750	0.8188	0.7216	0.5870	0.4087	0.2807	0.3022	0.5256	0.7484	0.8655	0.9137	(86)
MIT	18.9355	19.1902	19.6710	20.2098	20.6465	20.9004	20.9728	20.9670	20.7996	20.2691	19.5199	18.8634	(87)
Th 2	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	19.8009	(88)
util rest of house	0.8900	0.8572	0.7927	0.6813	0.5255	0.3228	0.1766	0.1946	0.4410	0.7019	0.8430	0.9007	(89)
MIT 2	17.9832	18.2279	18.6871	19.1856	19.5659	19.7556	19.7949	19.7930	19.6927	19.2543	18.5535	17.9143	(90)
Living area fraction									fLA = Living area / (4) =			0.4472	(91)
MIT	18.4091	18.6582	19.1271	19.6436	20.0491	20.2675	20.3216	20.3180	20.1877	19.7081	18.9856	18.3388	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2591	18.5082	18.9771	19.4936	19.8991	20.1175	20.1716	20.1680	20.0377	19.5581	18.8356	18.1888	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	460.0296	499.5832	516.2292	500.9307	413.2036	274.3864	158.0125	163.9927	304.4956	404.1389	433.8823	439.3316	(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	934.4368	916.6248	822.0992	681.2528	489.9133	292.3904	161.3108	168.1553	343.5273	565.1114	769.4482	929.4454	(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	352.9590	280.2520	227.5673	129.8319	57.0720	0.0000	0.0000	0.0000	0.0000	119.7635	241.6075	364.6447	(98)
Space heating												1773.6978	(98)
Space heating per m2												(98) / (4) =	33.7526 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1959.8871 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	352.9590	280.2520	227.5673	129.8319	57.0720	0.0000	0.0000	0.0000	0.0000	119.7635	241.6075	364.6447 (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)	390.0099	309.6707	251.4556	143.4606	63.0630	0.0000	0.0000	0.0000	0.0000	132.3354	266.9696	402.9223 (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	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614 (64)
Efficiency of water heater (217)m	89.5762	89.5092	89.3328	88.9950	88.3826	87.3000	87.3000	87.3000	87.3000	88.9009	89.3871	87.3000 (216)
Fuel for water heating, kWh/month	154.2683	135.4560	141.0916	124.9486	121.8259	108.0751	101.7744	114.4703	115.1482	129.8083	139.0283	149.8186 (219)
Water heating fuel used												1535.7138 (219)
Annual totals kWh/year												
Space heating fuel - main system												1959.8871 (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)												28.3114 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												103.3114 (231)
Electricity for lighting (calculated in Appendix L)												242.1807 (232)
Total delivered energy for all uses												3841.0929 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1959.8871	3.8700	75.8476 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1535.7138	3.8700	59.4321 (247)
Mechanical ventilation fans	28.3114	18.9000	5.3509 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	242.1807	18.9000	45.7721 (250)
Additional standing charges			93.0000 (251)
Total energy cost			293.5778 (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	1959.8871	0.2160	423.3356 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1535.7138	0.2160	331.7142 (264)
Space and water heating			755.0498 (265)
Pumps and fans	103.3114	0.5190	53.6186 (267)
Energy for lighting	242.1807	0.5190	125.6918 (268)
Total kg/year			934.3602 (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	1959.8871	1.2200	2391.0622 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1535.7138	1.2200	1873.5708 (264)
Space and water heating			4264.6330 (265)
Pumps and fans	103.3114	3.0700	317.1661 (267)
Energy for lighting	242.1807	3.0700	743.4947 (268)
Primary energy kWh/year			5325.2938 (272)
Primary energy kWh/m2/year			101.3377 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 82
Current environmental impact rating: B 86

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	
Potential energy efficiency rating:		B 82	
Potential environmental impact rating:			B 86

Fuel prices for cost data on this page from database revision number 478 TEST (27 May 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£65	£65	£0
Mains gas	£228	£228	£0
Space heating	£188	£188	£0
Water heating	£59	£59	£0
Lighting	£46	£46	£0
Total cost of fuels	£293	£293	£0
Total cost of uses	£293	£293	£0
Delivered energy	73 kWh/m²	73 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	18 kg/m²	18 kg/m²	0 kg/m²
Primary energy	101 kWh/m²	101 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	100.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	249.72 (P1)
Transmission heat loss coefficient	50.20 (37)
Summer heat loss coefficient	299.92 (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	2.6200	81.1852	0.4500	0.0000	0.9000	86.1456
East	5.5000	117.5071	0.4500	0.0000	0.9000	261.7470
South	3.8000	112.2060	0.4500	0.0000	0.9000	172.6850
total:						520.5776

	Jun	Jul	Aug	
Solar gains	550	521	471	(P4)
Internal gains	318	305	312	
Total summer gains	868	826	783	(P5)
Summer gain/loss ratio	2.90	2.75	2.61	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	20.20	21.95	21.71	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			