

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026d_116_As_Built				Issued on Date	04/02/2022
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	86 B	DER	14.56	TER	15.74	
Environmental	90 B	% DER<TER	7.50			
CO ₂ Emissions (t/year)	0.84	DFEE	31.21	TFEE	32.93	
General Requirements Compliance	Pass	% DFEE<TFEE	5.23			
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 71 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) 15.74 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.56 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 32.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 31.2 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.33 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.23 (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: 4.42 (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): Not significant OK

Based on:

Overshading: Average
Windows facing West: 6.68 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

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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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (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					4.4200
Infiltration rate					0.2210 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1713 (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	0.2184	0.2141	0.2098	0.1884	0.1841	0.1627	0.1627	0.1584	0.1713	0.1841	0.1927	0.2012 (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)			6.6800	1.2357	8.2548		(27)					
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)					
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)					
Total net area of external elements Aum(A, m2)			54.4800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.6074		(33)					
Party Wall 1			24.8600	0.0000	0.0000		(32)					
Party Floor 1			70.9600				(32d)					
Party Ceilings 1			70.9600				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8744 (36)					
Total fabric heat loss							(33) + (36) = 28.4818 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Average = Sum(39)m / 12 =	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974 (40)
HLP (average)												0.7974 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2692 (42)
Average daily hot water use (litres/day)													88.0936 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (46)

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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802 (61)
Total heat required for water heating calculated for each month												
Solar input	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501 (62)
	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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501 (64)
								Total per year (kWh/year) = Sum(64)m =			1550.9870 (64)	
Heat gains from water heating, kWh/month												
	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941 (65)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1876.9869 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	352.4345	272.7844	213.4176	102.1122	28.6218	0.0000	0.0000	0.0000	0.0000	112.7341	247.9290	368.6396	(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)	389.4303	301.4192	235.8206	112.8311	31.6262	0.0000	0.0000	0.0000	0.0000	124.5681	273.9547	407.3366	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Efficiency of water heater (217)m	89.4856	89.3971	89.1844	88.7002	87.8887	87.3000	87.3000	87.3000	87.3000	88.7490	89.3091	87.3000	(216)
Fuel for water heating, kWh/month	176.3357	154.8055	161.1623	142.7490	139.3433	122.6961	115.3229	130.0199	130.8860	148.0746	158.7259	171.1599	(219)
Water heating fuel used												1751.2812	(219)
Annual totals kWh/year													
Space heating fuel - main system												1876.9869	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.2298 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.2298 (231)
Electricity for lighting (calculated in Appendix L)													367.3218 (232)
Total delivered energy for all uses													4108.8197 (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	1876.9869	0.2160	405.4292	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1751.2812	0.2160	378.2767	(264)
Space and water heating			783.7059	(265)
Pumps and fans	113.2298	0.5190	58.7663	(267)
Energy for lighting	367.3218	0.5190	190.6400	(268)
Total CO2, kg/year			1033.1122	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5600	(273)

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

DER			14.5600	ZC1
Total Floor Area		TFA	70.9600	
Assumed number of occupants		N	2.2692	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6623	ZC2
CO2 emissions from cooking, equation (L16)			2.4445	ZC3
Total CO2 emissions			33.6668	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			33.6668	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1762 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4262 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3303 (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	0.4211	0.4128	0.4046	0.3633	0.3550	0.3138	0.3138	0.3055	0.3303	0.3550	0.3716	0.3881 (22b)
	0.5887	0.5852	0.5818	0.5660	0.5630	0.5492	0.5492	0.5467	0.5545	0.5630	0.5690	0.5753 (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)			6.6800	1.3258	8.8561			(27)					
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348			(29a)					
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876			(29a)					
Total net area of external elements Aum(A, m2)			54.4800					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	19.1985		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.9625 (36)					
Total fabric heat loss						(33) + (36) =	24.1610	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 33.0829	Feb 32.8894	Mar 32.6998	Apr 31.8090	May 31.6423	Jun 30.8664	Jul 30.8664	Aug 30.7228	Sep 31.1653	Oct 31.6423	Nov 31.9795	Dec 32.3320	(38)
Heat transfer coeff	57.2439	57.0504	56.8607	55.9699	55.8033	55.0274	55.0274	54.8837	55.3262	55.8033	56.1404	56.4929	(39)
Average = Sum(39)m / 12 =												55.9691	(39)
HLP	Jan 0.8067	Feb 0.8040	Mar 0.8013	Apr 0.7888	May 0.7864	Jun 0.7755	Jul 0.7755	Aug 0.7734	Sep 0.7797	Oct 0.7864	Nov 0.7912	Dec 0.7961	(40)
HLP (average)												0.7887	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)										Total = Sum(45)m =		1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (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	49.3807	42.9800	45.7894	42.5745	42.1980	39.0991	40.4024	42.1980	42.5745	45.7894	46.0500	49.3807 (61)

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Total heat required for water heating calculated for each month	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506 (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	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506 (64)
Heat gains from water heating, kWh/month	60.1268	52.5352	54.5710	48.2399	46.6240	40.9043	38.9467	43.6509	44.1403	50.4845	54.1246	58.6192 (65)
Total per year (kWh/year) = Sum (63)m =												1914.4720 (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	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	80.8157	78.1773	73.3482	66.9999	62.6667	56.8116	52.3477	58.6705	61.3060	67.8555	75.1731	78.7892	(72)
Total internal gains	361.1802	358.2868	344.7902	323.6846	302.4585	282.1011	269.4117	275.9896	287.2924	308.5992	332.8098	350.9281	(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	
West					6.6800	19.6403	0.6300	0.7000			0.7700	40.0955 (80)	
Solar gains		40.0955	78.4353	129.1718	188.3893	230.8782	236.3449	225.0100	193.2802	150.2321	93.0701	49.9944	32.9726 (83)
Total gains		401.2757	436.7221	473.9620	512.0740	533.3367	518.4460	494.4217	469.2698	437.5245	401.6693	382.8042	383.9007 (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	86.0839	86.3759	86.6640	88.0433	88.3063	89.5513	89.5513	89.7858	89.0676	88.3063	87.7759	87.2282
alpha	6.7389	6.7584	6.7776	6.8696	6.8871	6.9701	6.9701	6.9857	6.9378	6.8871	6.8517	6.8152
util living area	0.9983	0.9965	0.9899	0.9598	0.8610	0.6639	0.4880	0.5347	0.8072	0.9742	0.9961	0.9988 (86)
MIT	20.2159	20.3173	20.4979	20.7369	20.9153	20.9886	20.9988	20.9978	20.9594	20.7320	20.4349	20.1998 (87)
Th 2	20.2475	20.2499	20.2522	20.2631	20.2651	20.2746	20.2746	20.2764	20.2710	20.2651	20.2610	20.2567 (88)
util rest of house	0.9978	0.9954	0.9865	0.9463	0.8206	0.5952	0.4085	0.4524	0.7447	0.9628	0.9946	0.9984 (89)
MIT 2	19.1878	19.3375	19.6014	19.9489	20.1815	20.2670	20.2742	20.2754	20.2386	19.9483	19.5183	19.1713 (90)
Living area fraction	19.5558	19.6883	19.9223	20.2309	20.4441	20.5253	20.5335	20.5340	fLA = Living area / (4) =	20.2289	19.8464	0.3579 (91)
MIT	19.5558	19.6883	19.9223	20.2309	20.4441	20.5253	20.5335	20.5340	20.4966	20.2289	19.8464	19.5395 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5558	19.6883	19.9223	20.2309	20.4441	20.5253	20.5335	20.5340	20.4966	20.2289	19.8464	19.5395 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9943	0.9846	0.9456	0.8312	0.6195	0.4370	0.4819	0.7653	0.9622	0.9936	0.9978 (94)
Useful gains	400.1238	434.2475	466.6687	484.2092	443.3107	321.1577	216.0671	226.1562	334.8326	386.4673	380.3372	383.0669 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	873.3016	843.6754	763.2013	634.1912	487.9510	326.0533	216.4521	226.8898	353.8997	537.3214	715.5880	866.5705 (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	352.0443	275.1356	220.6202	107.9871	33.2124	0.0000	0.0000	0.0000	0.0000	112.2355	241.3806	359.7266 (98)
Space heating												1702.3422 (98)
Space heating per m2												23.9902 (99)
										(98) / (4) =		

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)
Fraction of space heat from main system(s)	1.0000 (202)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1822.6362 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	352.0443	275.1356	220.6202	107.9871	33.2124	0.0000	0.0000	0.0000	0.0000	112.2355	241.3806	359.7266	(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)	376.9211	294.5777	236.2101	115.6178	35.5593	0.0000	0.0000	0.0000	0.0000	120.1665	258.4374	385.1463	(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	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506	(64)
Efficiency of water heater (217)m	86.5444	86.2759	85.6285	84.1511	81.9536	80.3000	80.3000	80.3000	80.3000	84.1302	85.8725	86.6519	(216)
Fuel for water heating, kWh/month	223.1051	195.4946	204.9372	184.9603	183.8759	165.2825	158.3532	176.5268	178.4763	193.9783	202.8669	217.5955	(219)
Water heating fuel used												2285.4526	(219)
Annual totals kWh/year													
Space heating fuel - main system												1822.6362	(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)												367.3218	(232)
Total delivered energy for all uses												4550.4106	(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	1822.6362	0.2160	393.6894 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2285.4526	0.2160	493.6578 (264)
Space and water heating			887.3472 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total CO2, kg/m2/year			1116.9122 (272)
Emissions per m2 for space and water heating			12.5049 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6866 (272b)
Emissions per m2 for pumps and fans			0.5485 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.5049 * 1.00) + 2.6866 + 0.5485, rounded to 2 d.p.			15.7400 (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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1762 (8)
Pressure test					Yes
Measured/design AP50					4.4200
Infiltration rate					0.3972 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3078 (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												
	0.3924	0.3847	0.3770	0.3386	0.3309	0.2924	0.2924	0.2847	0.3078	0.3309	0.3463	0.3617 (22b)
Effective ac	0.5770	0.5740	0.5711	0.5573	0.5547	0.5428	0.5428	0.5405	0.5474	0.5547	0.5600	0.5654 (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)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-T-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m ²)			54.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.6074		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Floor 1			70.9600				(32d)
Party Ceilings 1			70.9600				(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)							5.8744 (36)
Total fabric heat loss						(33) + (36) =	28.4818 (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	32.4278	32.2598	32.0951	31.3214	31.1766	30.5028	30.5028	30.3780	30.7623	31.1766	31.4695	31.7756 (38)
Heat transfer coeff	60.9096	60.7416	60.5768	59.8031	59.6584	58.9845	58.9845	58.8597	59.2441	59.6584	59.9512	60.2574 (39)
Average = Sum(39)m / 12 =												59.8024 (39)
HLP	0.8584	0.8560	0.8537	0.8428	0.8407	0.8312	0.8312	0.8295	0.8349	0.8407	0.8449	0.8492 (40)
HLP (average)												0.8428 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)										Total = Sum(45)m =		1386.0553 (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)

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Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.5372	26.7080	27.5603	24.0277	23.0552	19.8948	18.4355	21.1550	21.4077	24.9486	27.2333	29.5736 (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	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	41.0446	39.7440	37.0434	33.3718	30.9881	27.6317	24.7789	28.4341	29.7329	33.5330	37.8240	39.7495	(72)
Total internal gains	318.4091	316.8535	305.4854	287.0566	267.7799	249.9213	238.8429	242.7532	252.7193	271.2767	292.4608	308.8884	(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	
West					6.6800	19.6403	0.4500	0.0000			0.7700	45.4597 (80)	
Solar gains	45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839	(83)
Total gains	363.8688	405.7824	451.9387	500.6499	529.5465	517.8860	493.9562	461.8918	423.0505	376.7984	349.1437	346.2723	(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	80.9031	81.1270	81.3476	82.4000	82.5999	83.5436	83.5436	83.7207	83.1775	82.5999	82.1964	81.7788	
alpha	6.3935	6.4085	6.4232	6.4933	6.5067	6.5696	6.5696	6.5814	6.5452	6.5067	6.4798	6.4519	
util living area	0.9991	0.9979	0.9932	0.9699	0.8861	0.7017	0.5218	0.5788	0.8521	0.9843	0.9979	0.9994	(86)
MIT	20.0864	20.1987	20.3991	20.6663	20.8800	20.9802	20.9975	20.9952	20.9322	20.6500	20.3205	20.0671	(87)
Th 2	20.2030	20.2051	20.2071	20.2164	20.2182	20.2263	20.2263	20.2279	20.2232	20.2182	20.2146	20.2109	(88)
util rest of house	0.9988	0.9972	0.9907	0.9590	0.8483	0.6280	0.4320	0.4856	0.7924	0.9768	0.9971	0.9991	(89)
MIT 2	19.3571	19.4709	19.6718	19.9407	20.1355	20.2170	20.2256	20.2264	20.1845	19.9296	19.6007	19.3445	(90)
Living area fraction	19.6181	19.7314	19.9321	20.2004	20.4019	20.4902	20.5019	20.5016	fLA = Living area / (4) =	20.4522	20.1875	19.8583	0.3579 (91)
MIT	19.6181	19.7314	19.9321	20.2004	20.4019	20.4902	20.5019	20.5016	20.4522	20.1875	19.8583	19.6031	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6181	19.7314	19.9321	20.2004	20.4019	20.4902	20.5019	20.5016	20.4522	20.1875	19.8583	19.6031	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9985	0.9967	0.9987	0.9587	0.8580	0.6540	0.4643	0.5192	0.8117	0.9764	0.9966	0.9989	(94)
Ext temp.	363.3292	404.4342	447.2798	479.9665	454.3679	338.7006	229.3359	239.7966	343.3826	367.9049	347.9619	345.8972	(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	933.0215	900.8839	813.6770	675.8012	519.1443	347.4301	230.1525	241.4197	376.3280	571.9723	764.8766	928.1509	(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	423.8510	333.6142	272.5995	141.0010	48.1936	0.0000	0.0000	0.0000	0.0000	151.8261	300.1786	433.1968	(98)
Space heating per m2												2104.4608	(98)
												29.6570	(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	554.4546	436.4855	447.3340	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9426	0.9768	0.9660	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	522.6480	426.3741	432.1345	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	690.9813	661.4127	625.7432	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	121.1999	174.8687	144.0449	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												440.1136	(104)
Cooled fraction												1.0000	(105)

$$fC = \text{cooled area} / (4) =$$

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Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	30.3000	43.7172	36.0112	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											110.0284 (107)
Space cooling per m2											1.5506 (108)
Energy for space heating											29.6570 (99)
Energy for space cooling											1.5506 (108)
Total											31.2076 (109)
Dwelling Fabric Energy Efficiency (DFEE)											31.2 (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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1762 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4262 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3303 (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												
	0.4211	0.4128	0.4046	0.3633	0.3550	0.3138	0.3138	0.3055	0.3303	0.3550	0.3716	0.3881 (22b)
Effective ac	0.5887	0.5852	0.5818	0.5660	0.5630	0.5492	0.5492	0.5467	0.5545	0.5630	0.5690	0.5753 (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)			6.6800	1.3258	8.8561		(27)					
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348		(29a)					
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876		(29a)					
Total net area of external elements Aum(A, m2)			54.4800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.1985		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.9625 (36)					
Total fabric heat loss						(33) + (36) =	24.1610 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.0829	Feb 32.8894	Mar 32.6998	Apr 31.8090	May 31.6423	Jun 30.8664	Jul 30.8664	Aug 30.7228	Sep 31.1653	Oct 31.6423	Nov 31.9795	Dec 32.3320 (38)
Heat transfer coeff	57.2439	57.0504	56.8607	55.9699	55.8033	55.0274	55.0274	54.8837	55.3262	55.8033	56.1404	56.4929 (39)
Average = Sum(39)m / 12 =												55.9691 (39)
HLP	Jan 0.8067	Feb 0.8040	Mar 0.8013	Apr 0.7888	May 0.7864	Jun 0.7755	Jul 0.7755	Aug 0.7734	Sep 0.7797	Oct 0.7864	Nov 0.7912	Dec 0.7961 (40)
HLP (average)												0.7887 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)	Total = Sum(45)m =											1386.0553 (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)

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Heat gains from water heating, kWh/month
30.5372 26.7080 27.5603 24.0277 23.0552 19.8948 18.4355 21.1550 21.4077 24.9486 27.2333 29.5736 (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	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	41.0446	39.7440	37.0434	33.3718	30.9881	27.6317	24.7789	28.4341	29.7329	33.5330	37.8240	39.7495	(72)
Total internal gains	318.4091	316.8535	305.4854	287.0566	267.7799	249.9213	238.8429	242.7532	252.7193	271.2767	292.4608	308.8884	(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
West					6.6800	19.6403	0.6300	0.7000			0.7700			40.0955 (80)
Solar gains	40.0955	78.4353	129.1718	188.3893	230.8782	236.3449	225.0100	193.2802	150.2321	93.0701	49.9944	32.9726	(83)	
Total gains	358.5046	395.2888	434.6572	475.4459	498.6581	486.2662	463.8528	436.0334	402.9514	364.3468	342.4551	341.8610	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	86.0839	86.3759	86.6640	88.0433	88.3063	89.5513	89.5513	89.7858	89.0676	88.3063	87.7759	87.2282	
alpha	6.7389	6.7584	6.7776	6.8696	6.8871	6.9701	6.9701	6.9857	6.9378	6.8871	6.8517	6.8152	
util living area	0.9992	0.9981	0.9938	0.9720	0.8899	0.7014	0.5193	0.5736	0.8492	0.9845	0.9980	0.9994	(86)
MIT	20.1561	20.2599	20.4453	20.6953	20.8934	20.9842	20.9982	20.9966	20.9438	20.6858	20.3789	20.1407	(87)
Th 2	20.2475	20.2499	20.2522	20.2631	20.2651	20.2746	20.2746	20.2764	20.2710	20.2651	20.2610	20.2567	(88)
util rest of house	0.9989	0.9975	0.9916	0.9619	0.8540	0.6314	0.4352	0.4863	0.7913	0.9772	0.9972	0.9992	(89)
MIT 2	19.4643	19.5698	19.7562	20.0100	20.1912	20.2672	20.2741	20.2754	20.2389	20.0053	19.6983	19.4567	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	(91)
MIT	19.7119	19.8168	20.0029	20.2553	20.4426	20.5239	20.5333	20.5335	20.4913	20.2489	19.9420	19.7015	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7119	19.8168	20.0029	20.2553	20.4426	20.5239	20.5333	20.5335	20.4913	20.2489	19.9420	19.7015	(93)

8. Space heating requirement

Utilisation	0.9986	0.9970	0.9907	0.9618	0.8635	0.6562	0.4654	0.5177	0.8103	0.9770	0.9968	0.9990	(94)
Useful gains	358.0115	394.0972	430.6201	457.2865	430.5684	319.0735	215.8706	225.7245	326.5007	355.9643	341.3565	341.5182	(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	882.2371	851.0113	767.7825	635.5552	487.8649	325.9741	216.4407	226.8645	353.6044	538.4406	720.9525	875.7258	(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	390.0239	307.0463	250.8488	128.3535	42.6286	0.0000	0.0000	0.0000	0.0000	135.7624	273.3091	397.4505	(98)
Space heating												1925.4229	(98)
Space heating per m2										(98) / (4) =		27.1339	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
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	517.2575	407.2027	417.1163	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9518	0.9820	0.9736	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	492.3321	399.8744	406.0868	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	654.0230	626.2270	595.5191	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	116.4175	168.4063	140.9376	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												425.7615	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

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	0.0000	0.0000	0.0000	0.0000	0.0000	29.1044	42.1016	35.2344	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												106.4404 (107)
Space cooling per m2												1.5000 (108)
Energy for space heating												27.1339 (99)
Energy for space cooling												1.5000 (108)
Total												28.6339 (109)
Target Fabric Energy Efficiency (TFEE)												32.9 (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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (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					4.4200
Infiltration rate					0.2210 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1713 (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	0.1798	0.1713	0.1713	0.1584	0.1584	0.1413	0.1456	0.1370	0.1413	0.1499	0.1499	0.1627 (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)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			54.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.6074		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Floor 1			70.9600				(32d)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8744 (36)
Total fabric heat loss						(33) + (36) =	28.4818 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Average = Sum(39)m / 12 =	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974	0.7974 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (46)

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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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
RHI water heating demand	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)
Heat gains from water heating, kWh/month													
	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(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	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(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
West					6.6800	22.3313	0.4500	0.0000			0.7700	51.6885 (80)
Solar gains	51.6885	90.9534	147.6923	221.3484	263.7460	288.7182	271.9842	239.2816	185.9848	115.1712	66.0257	42.0937 (83)
Total gains	569.7145	604.2133	640.3036	682.4992	693.0515	689.7821	656.8833	632.6347	597.7880	558.6361	544.3260	546.3950 (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	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910		
alpha	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061		
util living area	0.9832	0.9731	0.9369	0.8329	0.6402	0.4096	0.2670	0.2862	0.5448	0.8495	0.9630	0.9865	(86)	
MIT	20.5198	20.5992	20.7601	20.9157	20.9873	20.9995	21.0000	21.0000	20.9964	20.9189	20.7010	20.4900	(87)	
Th 2	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	(88)	
util rest of house	0.9784	0.9656	0.9203	0.7967	0.5854	0.3489	0.2029	0.2196	0.4769	0.8079	0.9513	0.9826	(89)	
MIT 2	19.8311	19.9080	20.0602	20.1960	20.2488	20.2554	20.2556	20.2556	20.2542	20.2013	20.0072	19.8021	(90)	
Living area fraction	20.0776	20.1554	20.3108	20.4536	20.5131	20.5218	20.5221	20.5220	20.5199	20.4582	20.2555	20.0483	(92)	
Temperature adjustment	19.9276	20.0054	20.1608	20.3036	20.3631	20.3718	20.3721	20.3720	20.3699	20.3082	20.1055	19.8983	(93)	
adjusted MIT														

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	555.9190	581.6570	587.7153	545.4690	411.3180	247.2146	139.8705	145.5262	291.3648	453.1277	516.2713	535.6191	(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	838.9746	815.0843	722.0282	588.6553	416.6208	247.3623	139.8734	145.5312	292.5220	492.7251	684.9543	837.3178	(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	210.5934	156.8631	99.9288	31.0941	3.9453	0.0000	0.0000	0.0000	0.0000	29.4605	121.4518	224.4639	(98)
Space heating												877.8009	(98)
RHI space heating demand												878	(98)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.4200					
Infiltration rate							0.2210	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1713	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Mechanical extract ventilation - decentralised	0.2184	0.2141	0.2098	0.1884	0.1841	0.1627	0.1627	0.1584	0.1713	0.1841	0.1927	0.2012 (22b)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross 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)			6.6800	1.2357	8.2548		(27)					
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29)					
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)					
Total net area of external elements Aum(A, m2)			54.4800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.6074		(33)					
Party Wall 1			24.8600	0.0000	0.0000		(32)					
Party Floor 1			70.9600				(32d)					
Party Ceilings 1			70.9600				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8744 (36)					
Total fabric heat loss							(33) + (36) = 28.4818 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.1002	Feb 28.1002	Mar 28.1002	Apr 28.1002	May 28.1002	Jun 28.1002	Jul 28.1002	Aug 28.1002	Sep 28.1002	Oct 28.1002	Nov 28.1002	Dec 28.1002 (38)
Heat transfer coeff	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819	56.5819 (39)
Average = Sum(39)m / 12 =												56.5819 (39)
HLP	Jan 0.7974	Feb 0.7974	Mar 0.7974	Apr 0.7974	May 0.7974	Jun 0.7974	Jul 0.7974	Aug 0.7974	Sep 0.7974	Oct 0.7974	Nov 0.7974	Dec 0.7974 (40)
HLP (average)												0.7974 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)	Total = Sum(45)m =											1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (46)

FULL SAP CALCULATION PRINTOUT

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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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(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	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(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	
West					6.6800	19.6403		0.4500	0.0000	0.7700		45.4597 (80)	
Solar gains	45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839	(83)
Total gains	563.4857	602.1888	639.0645	674.7442	691.0722	669.0286	640.0124	612.4917	582.1344	548.9865	534.9833	541.6852	(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	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	
alpha	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	
util living area	0.9878	0.9789	0.9529	0.8782	0.7292	0.5374	0.3886	0.4242	0.6554	0.9001	0.9756	0.9905	0.9905	(86)
MIT	20.4508	20.5453	20.7009	20.8697	20.9685	20.9964	20.9997	20.9994	20.9875	20.8666	20.6258	20.4144	20.4144	(87)
Th 2	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	(88)
util rest of house	0.9844	0.9731	0.9404	0.8496	0.6807	0.4767	0.3231	0.3560	0.5909	0.8698	0.9679	0.9878	0.9878	(89)
MIT 2	19.7633	19.8556	20.0048	20.1576	20.2362	20.2540	20.2555	20.2554	20.2495	20.1582	19.9351	19.7275	19.7275	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	0.3579	(91)
MIT	20.0094	20.1025	20.2540	20.4125	20.4983	20.5198	20.5219	20.5217	20.5136	20.4118	20.1824	19.9734	19.9734	(92)
Temperature adjustment												-0.1500	-0.1500	
adjusted MIT	19.8594	19.9525	20.1040	20.2625	20.3483	20.3698	20.3719	20.3717	20.3636	20.2618	20.0324	19.8234	19.8234	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9822	0.9703	0.9375	0.8499	0.6869	0.4861	0.3333	0.3667	0.6005	0.8701	0.9651	0.9859	(94)
Ext temp.	553.4454	584.3286	599.1384	573.4475	474.7196	325.1936	213.3394	224.5730	349.5766	477.6478	516.2942	534.0359	(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	880.3797	851.6980	769.7405	642.9136	489.3389	326.4639	213.4201	224.7278	354.4092	546.6828	731.7380	884.0026	(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	243.2391	179.6722	126.9279	50.0156	10.8767	0.0000	0.0000	0.0000	0.0000	51.3620	155.1195	260.3752	(98)
Space heating per m2												1077.5884	(98)
										(98) / (4) =		15.1859	(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													1190.7054 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	243.2391	179.6722	126.9279	50.0156	10.8767	0.0000	0.0000	0.0000	0.0000	51.3620	155.1195	260.3752	(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)	268.7725	198.5328	140.2519	55.2658	12.0185	0.0000	0.0000	0.0000	0.0000	56.7536	171.4028	287.7074	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Efficiency of water heater (217)m	89.2133	89.0793	88.7720	88.1829	87.5525	87.3000	87.3000	87.3000	87.3000	88.1761	88.9433	87.3000	(216)
Fuel for water heating, kWh/month	176.8739	155.3578	161.9109	143.5863	139.8783	122.6961	115.3229	130.0199	130.8860	149.0366	159.3789	171.6369	(219)
Water heating fuel used												1756.5847	(219)
Annual totals kWh/year													
Space heating fuel - main system												1190.7054	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.2298 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.2298 (231)
Electricity for lighting (calculated in Appendix L)													367.3218 (232)
Total delivered energy for all uses													3427.8417 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1190.7054	3.4800	41.4365 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1756.5847	3.4800	61.1291 (247)
Mechanical ventilation fans	38.2298	13.1900	5.0425 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	367.3218	13.1900	48.4497 (250)
Additional standing charges			120.0000 (251)
Total energy cost			285.9505 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0357 (257)
SAP value		85.5521
SAP rating (Section 12)		86 (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	1190.7054	0.2160	257.1924 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1756.5847	0.2160	379.4223 (264)
Space and water heating			636.6147 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			886.0209 (272)
CO2 emissions per m2			12.4900 (273)
EI value			89.7614
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	$3.48 / 0.8820 = 3.946$, stars = 4
Water heating environmental impact	$0.216 / 0.8820 = 0.2449$, stars = 4

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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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.4200					
Infiltration rate							0.2210	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1713	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
	0.1798	0.1713	0.1713	0.1584	0.1584	0.1413	0.1456	0.1370	0.1413	0.1499	0.1499	0.1627 (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)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			54.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.6074		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Floor 1			70.9600				(32d)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8744 (36)
Total fabric heat loss						(33) + (36) =	28.4818 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
Daily hot water use	Jan 96.9030	Feb 93.3792	Mar 89.8555	Apr 86.3317	May 82.8080	Jun 79.2842	Jul 79.2842	Aug 82.8080	Sep 86.3317	Oct 89.8555	Nov 93.3792	Dec 96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)	Total = Sum(45)m =											1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(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	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(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)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					

West			6.6800	22.3313	0.4500	0.0000	0.7700	51.6885 (80)				

Solar gains	51.6885	90.9534	147.6923	221.3484	263.7460	288.7182	271.9842	239.2816	185.9848	115.1712	66.0257	42.0937 (83)
Total gains	569.7145	604.2133	640.3036	682.4992	693.0515	689.7821	656.8833	632.6347	597.7880	558.6361	544.3260	546.3950 (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	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	87.0910	
alpha	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	6.8061	
util living area													
	0.9832	0.9731	0.9369	0.8329	0.6402	0.4096	0.2670	0.2862	0.5448	0.8495	0.9630	0.9865	(86)
MIT	20.5198	20.5992	20.7601	20.9157	20.9873	20.9995	21.0000	21.0000	20.9964	20.9189	20.7010	20.4900	(87)
Th 2	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	20.2556	(88)
util rest of house													
	0.9784	0.9656	0.9203	0.7967	0.5854	0.3489	0.2029	0.2196	0.4769	0.8079	0.9513	0.9826	(89)
MIT 2	19.8311	19.9080	20.0602	20.1960	20.2488	20.2554	20.2556	20.2556	20.2542	20.2013	20.0072	19.8021	(90)
Living area fraction									fLA = Living area / (4) =				0.3579 (91)
MIT	20.0776	20.1554	20.3108	20.4536	20.5131	20.5218	20.5221	20.5220	20.5199	20.4582	20.2555	20.0483	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9276	20.0054	20.1608	20.3036	20.3631	20.3718	20.3721	20.3720	20.3699	20.3082	20.1055	19.8983	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9758	0.9627	0.9179	0.7992	0.5935	0.3584	0.2129	0.2300	0.4874	0.8111	0.9485	0.9803	(94)
Useful gains	555.9190	581.6570	587.7153	545.4690	411.3180	247.2146	139.8705	145.5262	291.3648	453.1277	516.2713	535.6191	(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	838.9746	815.0843	722.0282	588.6553	416.6208	247.3623	139.8734	145.5312	292.5220	492.7251	684.9543	837.3178	(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	210.5934	156.8631	99.9288	31.0941	3.9453	0.0000	0.0000	0.0000	0.0000	29.4605	121.4518	224.4639	(98)
Space heating												877.8009	(98)
Space heating per m2										(98) / (4) =		12.3704	(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	969.9457	(211)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Space heating requirement	210.5934 156.8631 99.9288 31.0941 3.9453 0.0000 0.0000 0.0000 0.0000 29.4605 121.4518 224.4639	(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)	232.6999 173.3294 110.4186 34.3582 4.3594 0.0000 0.0000 0.0000 0.0000 32.5530 134.2009 248.0264	(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	157.7951 138.3916 143.7316 126.6186 122.4670 107.1137 100.6769 113.5074 114.2635 131.4148 141.7568 153.2501	(64)
Efficiency of water heater (217)m	89.1010 88.9714 88.5846 87.9129 87.3964 87.3000 87.3000 87.3000 87.3000 87.8690 88.7480 87.3000	(216)
Fuel for water heating, kWh/month	177.0968 155.5462 162.2535 144.0274 140.1281 122.6961 115.3229 130.0199 130.8860 149.5576 159.7295 171.8556	(219)
Water heating fuel used		1759.1197 (219)
Annual totals kWh/year		
Space heating fuel - main system		969.9457 (211)
Space heating fuel - secondary		0.0000 (215)
Electricity for pumps and fans:		
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)		
mechanical ventilation fans (SFP = 0.1840)		38.2298 (230a)
central heating pump		30.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		113.2298 (231)
Electricity for lighting (calculated in Appendix L)		367.3218 (232)
Total delivered energy for all uses		3209.6171 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	969.9457	3.6300	35.2090 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1759.1197	3.6300	63.8560 (247)
Mechanical ventilation fans	38.2298	19.4400	7.4319 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	367.3218	19.4400	71.4073 (250)
Additional standing charges			95.0000 (251)
Total energy cost			287.4843 (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	969.9457	0.2160	209.5083 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1759.1197	0.2160	379.9699 (264)
Space and water heating			589.4781 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			838.8844 (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	969.9457	1.2200	1183.3338 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1759.1197	1.2200	2146.1261 (264)
Space and water heating			3329.4599 (265)
Pumps and fans	113.2298	3.0700	347.6156 (267)
Energy for lighting	367.3218	3.0700	1127.6778 (268)
Primary energy kWh/year			4804.7533 (272)
Primary energy kWh/m2/year			67.7107 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
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	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 86
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	£93	£93	£0
Mains gas	£194	£194	£0
Space heating	£152	£152	£0
Water heating	£64	£64	£0
Lighting	£71	£71	£0
Total cost of fuels	£287	£287	£0
Total cost of uses	£287	£287	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	68 kWh/m²	68 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	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	337.20 (P1)
Transmission heat loss coefficient	28.48 (37)
Summer heat loss coefficient	365.68 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
West	1.000	0.90	1.000 0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b
			FF Specific data or Table 6c
West	6.6800	117.5071	0.4500 0.0000
total:			0.9000 317.9036

Solar gains	Jun	Jul	Aug	(P4)
Internal gains	337	318	280	
Total summer gains	398	382	390	(P5)
Summer gain/loss ratio	2.01	1.91	1.83	(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	18.26	20.06	19.88	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			