

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025i_123_As_Built			Issued on Date	01/03/2022
Assessment Reference	001	Prop Type Ref	TFF		
Property					
SAP Rating	84 B	DER	17.83	TER	18.82
Environmental	88 B	% DER<TER	5.24		
CO ₂ Emissions (t/year)	0.86	DFEE	42.21	TFEE	45.48
General Requirements Compliance	Pass	% DFEE<TFEE	7.21		
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk			Assessor ID	d168-0001
Client	Bellway Homes Thames Valley				

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

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DWELLING AS BUILT

Top-floor flat, total floor area 58 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.82 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.83 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.29 (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	1.24 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.30 (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 South East: 7.86 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	58.2200 (1b)	x 2.4000 (2b)	= 139.7280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.7280 (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					4.3000
Infiltration rate					0.2150 (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) =				0.1666 (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	0.2124	0.2083	0.2041	0.1833	0.1791	0.1583	0.1583	0.1541	0.1666	0.1791	0.1875	0.1958 (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)			7.8600	1.2357	9.7129		(27)
WT-E-01	33.5500	7.8600	25.6900	0.2000	5.1380		(29a)
WT-I-01	26.6400	2.1200	24.5200	0.2890	7.0861		(29a)
Flat Roof	58.2200		58.2200	0.1500	8.7330		(30)
Total net area of external elements Aum(A, m2)			118.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.7900	(33)
Party Wall 1					14.8800	0.0000	(32)
Party Floor 1					58.2200		(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3437 (36)
Total fabric heat loss							(33) + (36) = 41.1337 (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	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551 (38)
Heat transfer coeff	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888 (39)
Average = Sum(39)m / 12 =												64.1888 (39)
HLP	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025 (40)
HLP (average)												1.1025 (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												1.9309 (42)
Average daily hot water use (litres/day)												80.0585 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	88.0644	84.8620	81.6597	78.4574	75.2550	72.0527	72.0527	75.2550	78.4574	81.6597	84.8620	88.0644 (44)
Energy conte	130.5969	114.2209	117.8657	102.7582	98.5989	85.0834	78.8423	90.4727	91.5532	106.6964	116.4675	126.4761 (45)
Energy content (annual)												Total = Sum(45)m = 1259.6323 (45)
Distribution loss (46)m = 0.15 x (45)m	19.5895	17.1331	17.6799	15.4137	14.7898	12.7625	11.8263	13.5709	13.7330	16.0045	17.4701	18.9714 (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	14.0326	12.6579	13.9876	13.5063	13.9346	13.4599	13.8929	13.9200	13.4852	13.9657	13.5500	(61)	
Total heat required for water heating calculated for each month													
	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	(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	(63)	
								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
Output from w/h	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	(64)	
								Total per year (kWh/year) = Sum(64)m =					1424.0488 (64)
Heat gains from water heating, kWh/month													
	46.9316	41.1429	42.6872	37.5437	36.2678	31.6552	29.6883	33.5622	33.8127	38.9680	42.1129	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2383	14.4227	11.7293	8.8798	6.6378	5.6039	6.0552	7.8708	10.5642	13.4136	15.6557	16.6896 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.4365	170.1843	165.7798	156.4031	144.5667	133.4422	126.0104	124.2625	128.6670	138.0437	149.8801	161.0046 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544 (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)	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354 (71)
Water heating gains (Table 5)	63.0801	61.2246	57.3753	52.1440	48.7471	43.9656	39.9036	45.1104	46.9621	52.3763	58.4902	61.2356 (72)
Total internal gains	302.7181	300.7948	289.8477	272.3902	254.9149	237.9750	226.9324	232.2070	241.1566	258.7969	278.9892	293.8930 (73)

[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					
Southeast			7.8600	36.7938	0.4500	0.0000	0.7700	100.2076 (77)				
Solar gains	100.2076	170.6907	233.5464	289.3753	324.1245	321.7806	310.2308	284.3064	252.8814	188.6496	120.0257	85.7569 (83)
Total gains	402.9258	471.4855	523.3941	561.7656	579.0394	559.7556	537.1633	516.5134	494.0380	447.4465	399.0149	379.6499 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869
alpha	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991
util living area												
	0.9961	0.9907	0.9774	0.9407	0.8512	0.6881	0.5168	0.5579	0.7896	0.9550	0.9915	0.9971 (86)
MIT	19.9088	20.0785	20.3179	20.5961	20.8306	20.9583	20.9921	20.9884	20.9141	20.6091	20.1919	19.8613 (87)
Th 2	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988 (88)
util rest of house												
	0.9949	0.9877	0.9699	0.9202	0.8018	0.5985	0.4039	0.4434	0.7108	0.9352	0.9882	0.9962 (89)
MIT 2	19.0113	19.1795	19.4149	19.6807	19.8874	19.9801	19.9968	19.9956	19.9541	19.6980	19.2932	18.9641 (90)
Living area fraction									fLA = Living area / (4) =			0.4483 (91)
MIT	19.4137	19.5825	19.8197	20.0911	20.3103	20.4186	20.4430	20.4407	20.3845	20.1064	19.6961	19.3663 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2637	19.4325	19.6697	19.9411	20.1603	20.2686	20.2930	20.2907	20.2345	19.9564	19.5461	19.2163 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9936	0.9855	0.9668	0.9188	0.8106	0.6240	0.4378	0.4777	0.7312	0.9342	0.9863	0.9952 (94)
Useful gains	400.3581	464.6718	506.0193	516.1674	469.3842	349.2868	235.1557	246.7549	361.2179	418.0010	393.5348	377.8322 (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	960.5017	932.8262	845.3485	708.7128	543.0546	363.8599	237.0510	249.7371	393.7640	600.5795	798.8996	963.8774 (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	416.7469	314.5998	252.4609	138.6327	54.8107	0.0000	0.0000	0.0000	0.0000	135.8384	291.8627	436.0176 (98)
Space heating												2040.9697 (98)
Space heating per m2												35.0562 (99)
										(98) / (4) =		

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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												2255.2151 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	416.7469	314.5998	252.4609	138.6327	54.8107	0.0000	0.0000	0.0000	0.0000	135.8384	291.8627	436.0176 (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)	460.4938	347.6241	278.9623	153.1853	60.5644	0.0000	0.0000	0.0000	0.0000	150.0977	322.5002	481.7874 (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	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	140.5000 (64)
Efficiency of water heater	89.6533	89.5566	89.3760	89.0118	88.3229	87.3000	87.3000	87.3000	87.3000	88.9659	89.4891	87.3000 (216)
(217)m	89.6533	89.5566	89.3760	89.0118	88.3229	87.3000	87.3000	87.3000	87.3000	88.9659	89.4891	89.6987 (217)
Fuel for water heating, kWh/month	161.3208	141.6745	147.5265	130.6170	127.4116	112.8790	106.2259	119.5792	120.3189	135.6273	145.2887	156.6355 (219)
Water heating fuel used												1605.1047 (219)
Annual totals kWh/year												
Space heating fuel - main system												2255.2151 (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)												31.3661 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												106.3661 (231)
Electricity for lighting (calculated in Appendix L)												286.7727 (232)
Total delivered energy for all uses												4253.4586 (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	2255.2151	0.2160	487.1265 (261)	
Space heating - secondary	0.0000	0.0000	0.0000 (263)	
Water heating (other fuel)	1605.1047	0.2160	346.7026 (264)	
Space and water heating			833.8291 (265)	
Pumps and fans	106.3661	0.5190	55.2040 (267)	
Energy for lighting	286.7727	0.5190	148.8350 (268)	
Total CO2, kg/year			1037.8681 (272)	
Dwelling Carbon Dioxide Emission Rate (DER)			17.8300 (273)	

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

DER			17.8300 ZC1
Total Floor Area	TFA		58.2200
Assumed number of occupants	N		1.9309
CO2 emission factor in Table 12 for electricity displaced from grid	EF		0.5190
CO2 emissions from appliances, equation (L14)			17.1439 ZC2
CO2 emissions from cooking, equation (L16)			2.8399 ZC3
Total CO2 emissions			37.8139 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			37.8139 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	58.2200 (1b)	x 2.4000 (2b)	= 139.7280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.7280 (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				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) = 0.1431 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3931 (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) =				0.3047 (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	0.3885	0.3808	0.3732	0.3351	0.3275	0.2894	0.2894	0.2818	0.3047	0.3275	0.3428	0.3580 (22b)
Effective ac	0.5755	0.5725	0.5697	0.5562	0.5536	0.5419	0.5419	0.5397	0.5464	0.5536	0.5587	0.5641 (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)			7.8600	1.3258	10.4205		(27)
WT-E-01	33.5500	7.8600	25.6900	0.1800	4.6242		(29a)
WT-I-01	26.6400	2.1200	24.5200	0.1800	4.4136		(29a)
Flat Roof	58.2200		58.2200	0.1300	7.5686		(30)
Total net area of external elements Aum, m ²			118.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.1469	(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)							7.5641 (36)
Total fabric heat loss						(33) + (36) =	36.7110 (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	26.5343	26.3992	26.2668	25.6448	25.5284	24.9867	24.9867	24.8863	25.1953	25.5284	25.7638	26.0099 (38)
Heat transfer coeff	63.2452	63.1101	62.9777	62.3557	62.2393	61.6976	61.6976	61.5973	61.9063	62.2393	62.4748	62.7209 (39)
Average = Sum(39)m / 12 =												62.3552 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0863	1.0840	1.0817	1.0710	1.0690	1.0597	1.0597	1.0580	1.0633	1.0690	1.0731	1.0773 (40)
HLP (average)												1.0710 (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												1.9309 (42)
Average daily hot water use (litres/day)												80.0585 (43)
Daily hot water use	88.0644	84.8620	81.6597	78.4574	75.2550	72.0527	72.0527	75.2550	78.4574	81.6597	84.8620	88.0644 (44)
Energy conte	130.5969	114.2209	117.8657	102.7582	98.5989	85.0834	78.8423	90.4727	91.5532	106.6964	116.4675	126.4761 (45)
Energy content (annual)										Total = Sum(45)m =		1259.6323 (45)
Distribution loss (46)m = 0.15 x (45)m	19.5895	17.1331	17.6799	15.4137	14.7898	12.7625	11.8263	13.5709	13.7330	16.0045	17.4701	18.9714 (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

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Combi loss	44.8766	39.0598	41.6129	38.6913	38.3491	35.5328	36.7173	38.3491	38.6913	41.6129	41.8498	44.8766 (61)
Total heat required for water heating calculated for each month	175.4736	153.2807	159.4786	141.4495	136.9481	120.6162	115.5595	128.8218	130.2445	148.3093	158.3173	171.3528 (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	175.4736	153.2807	159.4786	141.4495	136.9481	120.6162	115.5595	128.8218	130.2445	148.3093	158.3173	171.3528 (64)
Heat gains from water heating, kWh/month	54.6426	47.7434	49.5936	43.8399	42.3714	37.1734	35.3944	39.6694	40.1143	45.8798	49.1879	53.2725 (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	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2383	14.4227	11.7293	8.8798	6.6378	5.6039	6.0552	7.8708	10.5642	13.4136	15.6557	16.6896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.4365	170.1843	165.7798	156.4031	144.5667	133.4422	126.0104	124.2625	128.6670	138.0437	149.8801	161.0046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	(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)	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	(71)
Water heating gains (Table 5)	73.4444	71.0467	66.6580	60.8888	56.9508	51.6298	47.5731	53.3191	55.7143	61.6664	68.3165	71.6028	(72)
Total internal gains	313.0824	310.6170	299.1304	281.1350	263.1187	245.6392	234.6019	240.4157	249.9087	268.0870	288.8155	304.2602	(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

Southeast					7.8600	36.7938		0.6300	0.7000	0.7700		88.3831 (77)

Solar gains	88.3831	150.5492	205.9879	255.2291	285.8778	283.8105	273.6236	250.7583	223.0414	166.3889	105.8626	75.6375 (83)
Total gains	401.4655	461.1662	505.1184	536.3641	548.9965	529.4497	508.2255	491.1740	472.9501	434.4759	394.6782	379.8978 (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	63.9266	64.0635	64.1982	64.8386	64.9598	65.5302	65.5302	65.6369	65.3093	64.9598	64.7150	64.4611	
alpha	5.2618	5.2709	5.2799	5.3226	5.3307	5.3687	5.3687	5.3758	5.3540	5.3307	5.3143	5.2974	
util living area	0.9962	0.9914	0.9799	0.9468	0.8634	0.6994	0.5254	0.5638	0.7968	0.9573	0.9917	0.9971	(86)
MIT	19.9289	20.0875	20.3169	20.5963	20.8284	20.9597	20.9927	20.9895	20.9175	20.6212	20.2196	19.8967	(87)
Th 2	20.0120	20.0139	20.0158	20.0246	20.0262	20.0339	20.0339	20.0353	20.0309	20.0262	20.0229	20.0194	(88)
util rest of house	0.9949	0.9887	0.9731	0.9282	0.8168	0.6121	0.4146	0.4522	0.7204	0.9385	0.9885	0.9962	(89)
MIT 2	18.5915	18.8232	19.1554	19.5551	19.8588	20.0070	20.0311	20.0310	19.9674	19.5971	19.0231	18.5498	(90)
Living area fraction									fLA = Living area / (4) =			0.4483	(91)
MIT	19.1911	19.3900	19.6761	20.0219	20.2935	20.4341	20.4622	20.4607	20.3933	20.0562	19.5595	19.1536	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1911	19.3900	19.6761	20.0219	20.2935	20.4341	20.4622	20.4607	20.3933	20.0562	19.5595	19.1536	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9935	0.9864	0.9702	0.9281	0.8308	0.6499	0.4646	0.5025	0.7512	0.9392	0.9865	0.9950	(94)
Ext temp.	398.8595	454.8862	490.0762	497.8144	456.1312	344.0716	236.1025	246.8183	355.2619	408.0530	389.3383	378.0079	(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	941.7881	914.4676	829.7991	693.5131	534.8521	359.9486	238.2891	250.1252	389.5958	588.5487	778.4045	937.9050	(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	403.9388	308.8387	252.7538	140.9030	58.5683	0.0000	0.0000	0.0000	0.0000	134.2888	280.1277	416.5634	(98)
												1995.9826	(98)
												34.2835	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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												2137.0264 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	403.9388	308.8387	252.7538	140.9030	58.5683	0.0000	0.0000	0.0000	0.0000	134.2888	280.1277	416.5634 (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)	432.4827	330.6624	270.6144	150.8598	62.7070	0.0000	0.0000	0.0000	0.0000	143.7782	299.9226	445.9994 (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	175.4736	153.2807	159.4786	141.4495	136.9481	120.6162	115.5595	128.8218	130.2445	148.3093	158.3173	171.3528 (64)
Efficiency of water heater	87.0829	86.7796	86.2053	85.0415	83.0806	80.3000	80.3000	80.3000	80.3000	84.8023	86.4727	80.3000 (216)
Fuel for water heating, kWh/month	201.5018	176.6322	184.9986	166.3300	164.8377	150.2070	143.9097	160.4256	162.1974	174.8884	183.0836	196.4983 (219)
Water heating fuel used												2065.5103 (219)
Annual totals kWh/year												
Space heating fuel - main system												2137.0264 (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)												286.7727 (232)
Total delivered energy for all uses												4564.3094 (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	2137.0264	0.2160	461.5977 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.5103	0.2160	446.1502 (264)
Space and water heating			907.7479 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	286.7727	0.5190	148.8350 (268)
Total CO2, kg/m2/year			1095.5080 (272)
Emissions per m2 for space and water heating			15.5917 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5564 (272b)
Emissions per m2 for pumps and fans			0.6686 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5917 * 1.00) + 2.5564 + 0.6686, rounded to 2 d.p.			18.8200 (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	58.2200 (1b)	x 2.4000 (2b)	= 139.7280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.7280 (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) =
Measured/design AP50					Yes
Infiltration rate					4.3000
Number of sides sheltered					0.3581 (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) =				0.2776 (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	0.3539	0.3469	0.3400	0.3053	0.2984	0.2637	0.2637	0.2567	0.2776	0.2984	0.3122	0.3261 (22b)
Effective ac	0.5626	0.5602	0.5578	0.5466	0.5445	0.5348	0.5348	0.5330	0.5385	0.5445	0.5487	0.5532 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			7.8600	1.2357	9.7129		(27)
WT-E-01	33.5500	7.8600	25.6900	0.2000	5.1380		(29a)
WT-I-01	26.6400	2.1200	24.5200	0.2890	7.0861		(29a)
Flat Roof	58.2200		58.2200	0.1500	8.7330		(30)
Total net area of external elements Aum, m ²			118.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.7900		(33)
Party Wall 1			14.8800	0.0000	0.0000		(32)
Party Floor 1			58.2200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3437 (36)
Total fabric heat loss						(33) + (36) =	41.1337 (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	25.9424	25.8303	25.7204	25.2042	25.1076	24.6580	24.6580	24.5748	24.8312	25.1076	25.3030	25.5072 (38)
Heat transfer coeff	67.0761	66.9640	66.8541	66.3379	66.2413	65.7918	65.7918	65.7085	65.9649	66.2413	66.4367	66.6409 (39)
Average = Sum(39)m / 12 =												66.3374 (39)
HLP	1.1521	1.1502	1.1483	1.1394	1.1378	1.1301	1.1301	1.1286	1.1330	1.1378	1.1411	1.1446 (40)
HLP (average)												1.1394 (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												1.9309 (42)
Average daily hot water use (litres/day)												80.0585 (43)
Daily hot water use	88.0644	84.8620	81.6597	78.4574	75.2550	72.0527	72.0527	75.2550	78.4574	81.6597	84.8620	88.0644 (44)
Energy conte	130.5969	114.2209	117.8657	102.7582	98.5989	85.0834	78.8423	90.4727	91.5532	106.6964	116.4675	126.4761 (45)
Energy content (annual)										Total = Sum(45)m =		1259.6323 (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)

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	27.7518	24.2719	25.0465	21.8361	20.9523	18.0802	16.7540	19.2254	19.4551	22.6730	24.7493	26.8762 (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	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2383	14.4227	11.7293	8.8798	6.6378	5.6039	6.0552	7.8708	10.5642	13.4136	15.6557	16.6896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.4365	170.1843	165.7798	156.4031	144.5667	133.4422	126.0104	124.2625	128.6670	138.0437	149.8801	161.0046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	(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)	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	(71)
Water heating gains (Table 5)	37.3009	36.1190	33.6646	30.3279	28.1617	25.1114	22.5188	25.8406	27.0209	30.4744	34.3741	36.1239	(72)
Total internal gains	273.9389	272.6892	263.1370	247.5742	231.3295	216.1208	206.5476	209.9372	218.2154	233.8951	251.8731	265.7813	(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	
Southeast	7.8600		36.7938		0.4500		0.0000		0.7700		100.2076 (77)	
Solar gains	100.2076	170.6907	233.5464	289.3753	324.1245	321.7806	310.2308	284.3064	252.8814	188.6496	120.0257	85.7569 (83)
Total gains	374.1465	443.3799	496.6834	536.9495	555.4540	537.9014	516.7785	494.2436	471.0968	422.5446	371.8988	351.5382 (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	60.2757	60.3766	60.4758	60.9464	61.0352	61.4523	61.4523	61.5302	61.2910	61.0352	60.8558	60.6692	
alpha	5.0184	5.0251	5.0317	5.0631	5.0690	5.0968	5.0968	5.1020	5.0861	5.0690	5.0571	5.0446	
util living area	0.9973	0.9932	0.9828	0.9526	0.8753	0.7198	0.5469	0.5912	0.8210	0.9658	0.9940	0.9980	(86)
MIT	19.7954	19.9713	20.2235	20.5294	20.7900	20.9452	20.9889	20.9837	20.8893	20.5460	20.1052	19.7587	(87)
Th 2	19.9585	19.9601	19.9616	19.9688	19.9701	19.9764	19.9764	19.9775	19.9740	19.9701	19.9674	19.9645	(88)
util rest of house	0.9964	0.9909	0.9768	0.9352	0.8294	0.6288	0.4265	0.4699	0.7448	0.9497	0.9916	0.9973	(89)
MIT 2	18.8660	19.0420	19.2923	19.5936	19.8292	19.9513	19.9736	19.9730	19.9147	19.6154	19.1820	18.8343	(90)
Living area fraction	19.2826	19.4586	19.7097	20.0131	20.2600	20.3968	20.4288	20.4261	20.3516	20.0326	19.5958	19.2487	(91)
MIT	19.2826	19.4586	19.7097	20.0131	20.2600	20.3968	20.4288	20.4261	20.3516	20.0326	19.5958	19.2487	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2826	19.4586	19.7097	20.0131	20.2600	20.3968	20.4288	20.4261	20.3516	20.0326	19.5958	19.2487	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	372.4927	438.7282	484.2895	502.6207	468.6451	359.4556	248.5444	259.3659	365.3468	401.7786	368.3333	350.3830	(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	1004.9771	974.9012	883.1250	737.2201	567.0230	381.3839	251.9006	264.5484	412.3889	624.8259	830.1824	1002.8617	(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	470.5684	360.3082	296.7337	168.9116	73.1931	0.0000	0.0000	0.0000	0.0000	165.9472	332.5313	485.4441	(98)
Space heating												2353.6376	(98)
Space heating per m2												40.4266	(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	618.4425	486.8590	499.3846	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8838	0.9391	0.9247	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.6086	457.2122	461.7663	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	701.5298	675.4734	650.4242	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	111.5432	162.3863	140.3614	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												414.2910	(104)
Cooled fraction												1.0000	(105)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF 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	0.0000	27.8858	40.5966	35.0904	0.0000	0.0000	0.0000 (107)
Space cooling											103.5727 (107)
Space cooling per m2											1.7790 (108)
Energy for space heating											40.4266 (99)
Energy for space cooling											1.7790 (108)
Total											42.2056 (109)
Dwelling Fabric Energy Efficiency (DFEE)											42.2 (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	58.2200 (1b)	x 2.4000 (2b)	= 139.7280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.7280 (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				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) =	0.1431 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3931 (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) =		0.3047 (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	0.3885	0.3808	0.3732	0.3351	0.3275	0.2894	0.2894	0.2818	0.3047	0.3275	0.3428	0.3580 (22b)
Effective ac	0.5755	0.5725	0.5697	0.5562	0.5536	0.5419	0.5419	0.5397	0.5464	0.5536	0.5587	0.5641 (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)			7.8600	1.3258	10.4205		(27)
WT-E-01	33.5500	7.8600	25.6900	0.1800	4.6242		(29a)
WT-I-01	26.6400	2.1200	24.5200	0.1800	4.4136		(29a)
Flat Roof	58.2200		58.2200	0.1300	7.5686		(30)
Total net area of external elements Aum, m ²			118.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.1469		(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)							7.5641 (36)
Total fabric heat loss						(33) + (36) =	36.7110 (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	26.5343	26.3992	26.2668	25.6448	25.5284	24.9867	24.9867	24.8863	25.1953	25.5284	25.7638	26.0099 (38)
Heat transfer coeff	63.2452	63.1101	62.9777	62.3557	62.2393	61.6976	61.6976	61.5973	61.9063	62.2393	62.4748	62.7209 (39)
Average = Sum(39)m / 12 =												62.3552 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0863	1.0840	1.0817	1.0710	1.0690	1.0597	1.0597	1.0580	1.0633	1.0690	1.0731	1.0773 (40)
HLP (average)												1.0710 (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												1.9309 (42)
Average daily hot water use (litres/day)												80.0585 (43)
Daily hot water use	88.0644	84.8620	81.6597	78.4574	75.2550	72.0527	72.0527	75.2550	78.4574	81.6597	84.8620	88.0644 (44)
Energy conte	130.5969	114.2209	117.8657	102.7582	98.5989	85.0834	78.8423	90.4727	91.5532	106.6964	116.4675	126.4761 (45)
Energy content (annual)										Total = Sum(45)m =		1259.6323 (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	27.7518	24.2719	25.0465	21.8361	20.9523	18.0802	16.7540	19.2254	19.4551	22.6730	24.7493	26.8762 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443	96.5443 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2383	14.4227	11.7293	8.8798	6.6378	5.6039	6.0552	7.8708	10.5642	13.4136	15.6557	16.6896 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.4365	170.1843	165.7798	156.4031	144.5667	133.4422	126.0104	124.2625	128.6670	138.0437	149.8801	161.0046 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544	32.6544 (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)	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354 (71)
Water heating gains (Table 5)	37.3009	36.1190	33.6646	30.3279	28.1617	25.1114	22.5188	25.8406	27.0209	30.4744	34.3741	36.1239 (72)
Total internal gains	273.9389	272.6892	263.1370	247.5742	231.3295	216.1208	206.5476	209.9372	218.2154	233.8951	251.8731	265.7813 (73)

6. Solar gains

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Southeast	7.8600											
Solar gains	88.3831	150.5492	205.9879	255.2291	285.8778	283.8105	273.6236	250.7583	223.0414	166.3889	105.8626	75.6375 (83)
Total gains	362.3220	423.2384	469.1249	502.8032	517.2073	499.9313	480.1712	460.6955	441.2567	400.2840	357.7357	341.4189 (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	63.9266	64.0635	64.1982	64.8386	64.9598	65.5302	65.5302	65.6369	65.3093	64.9598	64.7150	64.4611
alpha	5.2618	5.2709	5.2799	5.3226	5.3307	5.3687	5.3687	5.3758	5.3540	5.3307	5.3143	5.2974
util living area	0.9976	0.9942	0.9853	0.9583	0.8854	0.7297	0.5535	0.5969	0.8286	0.9691	0.9947	0.9983 (86)
MIT	19.8662	20.0280	20.2634	20.5538	20.8020	20.9507	20.9907	20.9863	20.8992	20.5753	20.1614	19.8346 (87)
Th 2	20.0120	20.0139	20.0158	20.0246	20.0262	20.0339	20.0339	20.0353	20.0309	20.0262	20.0229	20.0194 (88)
util rest of house	0.9969	0.9923	0.9802	0.9429	0.8429	0.6425	0.4382	0.4808	0.7563	0.9546	0.9926	0.9977 (89)
MIT 2	18.9797	19.1422	19.3765	19.6652	19.8915	20.0108	20.0314	20.0313	19.9761	19.6912	19.2829	18.9542 (90)
Living area fraction	19.3771	19.5393	19.7741	20.0635	20.2997	20.4322	20.4615	20.4594	20.3899	20.0876	19.6768	19.3489 (92)
MIT	19.3771	19.5393	19.7741	20.0635	20.2997	20.4322	20.4615	20.4594	20.3899	20.0876	19.6768	19.3489 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3771	19.5393	19.7741	20.0635	20.2997	20.4322	20.4615	20.4594	20.3899	20.0876	19.6768	19.3489 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9962	0.9911	0.9787	0.9436	0.8561	0.6804	0.4903	0.5333	0.7856	0.9557	0.9916	0.9972 (94)
Useful gains	360.9376	419.4649	459.1127	474.4625	442.7823	340.1522	235.4237	245.6802	346.6424	382.5406	354.7380	340.4509 (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	953.5550	923.8912	835.9746	696.1100	535.2385	359.8309	238.2437	250.0495	389.3847	590.5005	785.7308	950.1527 (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	440.9073	338.9745	280.3853	159.5862	68.7874	0.0000	0.0000	0.0000	0.0000	154.7222	310.3148	453.6181 (98)
Space heating												2207.2958 (98)
Space heating per m2												37.9130 (99)
										(98) / (4) =		

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	579.9575	456.5623	468.1394	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8906	0.9448	0.9317	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	516.4893	431.3538	436.1714	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	657.1491	632.6857	611.2120	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	101.2750	149.7909	130.2302	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												381.2962 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.3188	37.4477	32.5576	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													95.3241 (107)
Space cooling per m2													1.6373 (108)
Energy for space heating													37.9130 (99)
Energy for space cooling													1.6373 (108)
Total													39.5503 (109)
Target Fabric Energy Efficiency (TFEE)													45.5 (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	58.2200 (1b)	x 2.4000 (2b)	= 139.7280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.7280 (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							4.3000					
Infiltration rate							0.2150	(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) =	0.1666	(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	0.1750	0.1666	0.1666	0.1541	0.1541	0.1375	0.1416	0.1333	0.1375	0.1458	0.1458	0.1583 (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)			7.8600	1.2357	9.7129		(27)
WT-E-01	33.5500	7.8600	25.6900	0.2000	5.1380		(29a)
WT-I-01	26.6400	2.1200	24.5200	0.2890	7.0861		(29a)
Flat Roof	58.2200		58.2200	0.1500	8.7330		(30)
Total net area of external elements Aum(A, m2)			118.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	32.7900		(33)
Party Wall 1			14.8800	0.0000	0.0000		(32)
Party Floor 1			58.2200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3437 (36)
Total fabric heat loss						(33) + (36) =	41.1337 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9309 (42)
Average daily hot water use (litres/day)												80.0585 (43)
Daily hot water use	Jan 88.0644	Feb 84.8620	Mar 81.6597	Apr 78.4574	May 75.2550	Jun 72.0527	Jul 72.0527	Aug 75.2550	Sep 78.4574	Oct 81.6597	Nov 84.8620	Dec 88.0644 (44)
Energy conte	130.5969	114.2209	117.8657	102.7582	98.5989	85.0834	78.8423	90.4727	91.5532	106.6964	116.4675	126.4761 (45)
Energy content (annual)										Total = Sum(45)m =		1259.6323 (45)
Distribution loss (46)m = 0.15 x (45)m	19.5895	17.1331	17.6799	15.4137	14.7898	12.7625	11.8263	13.5709	13.7330	16.0045	17.4701	18.9714 (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	14.0326	12.6579	13.9876	13.5063	13.9346	13.4599	13.8929	13.9200	13.4852	13.9657	13.5500	14.0239	(61)
Total heat required for water heating calculated for each month	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	140.5000	(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	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	140.5000	(64)
RHI water heating demand	46.9316	41.1429	42.6872	37.5437	36.2678	31.6552	29.6883	33.5622	33.8127	38.9680	42.1129	45.5593	(65)
Heat gains from water heating, kWh/month													
	46.9316	41.1429	42.6872	37.5437	36.2678	31.6552	29.6883	33.5622	33.8127	38.9680	42.1129	45.5593	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.5956	36.0567	29.3233	22.1996	16.5945	14.0097	15.1380	19.6770	26.4104	33.5341	39.1392	41.7239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.3977	254.0064	247.4325	233.4375	215.7713	199.1675	188.0752	185.4664	192.0403	206.0354	223.7016	240.3054	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	(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)	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	(71)
Water heating gains (Table 5)	63.0801	61.2246	57.3753	52.1440	48.7471	43.9656	39.9036	45.1104	46.9621	52.3763	58.4902	61.2356	(72)
Total internal gains	445.2074	441.4216	424.2650	397.9150	371.2467	347.2767	333.2507	340.3877	355.5468	382.0796	411.4649	433.3988	(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				
Southeast				7.8600	40.4699	0.4500	0.0000	0.7700	110.2194	(77)			
Solar gains	110.2194	168.8930	228.6385	293.3843	321.8731	342.8585	326.6073	304.6829	268.7790	199.3559	135.2254	93.4358	(83)
Total gains	555.4268	610.3146	652.9036	691.2993	693.1198	690.1352	659.8580	645.0706	624.3257	581.4356	546.6903	526.8346	(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	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869		
alpha	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991		
util living area	0.9803	0.9672	0.9333	0.8511	0.6931	0.4604	0.3011	0.3179	0.5792	0.8538	0.9587	0.9842	(86)	
MIT	20.2252	20.3520	20.5711	20.7980	20.9461	20.9947	20.9996	20.9994	20.9827	20.8260	20.4950	20.1830	(87)	
Th 2	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	(88)	
util rest of house	0.9743	0.9575	0.9138	0.8105	0.6225	0.3706	0.2041	0.2187	0.4869	0.8054	0.9445	0.9792	(89)	
MIT 2	19.3231	19.4457	19.6537	19.8557	19.9698	19.9972	19.9987	19.9987	19.9922	19.8835	19.5858	19.2821	(90)	
Living area fraction	19.7276	19.8520	20.0649	20.2782	20.4075	20.4444	20.4474	20.4473	20.4362	20.3060	19.9934	19.6860	(92)	
Temperature adjustment	19.5776	19.7020	19.9149	20.1282	20.2575	20.2944	20.2974	20.2973	20.2862	20.1560	19.8434	19.5360	(93)	
adjusted MIT														

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	539.3836	582.2672	595.3935	564.3038	444.6914	274.2469	153.8253	160.2135	321.0293	473.2025	514.9212	514.3915	(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	929.2973	905.1919	803.3194	656.5334	465.8487	275.6536	153.8863	160.3001	326.4803	549.2020	760.2137	926.6282	(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	290.0958	217.0054	154.6969	66.4053	15.7410	0.0000	0.0000	0.0000	0.0000	56.5437	176.6105	306.7041	(98)
Space heating												1283.8027	(98)
RHI space heating demand												1284	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.2200 (1b)	x 2.4000 (2b)	= 139.7280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.7280 (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					4.3000
Infiltration rate					0.2150 (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) =				0.1666 (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	0.2124	0.2083	0.2041	0.1833	0.1791	0.1583	0.1583	0.1541	0.1666	0.1791	0.1875	0.1958 (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)			7.8600	1.2357	9.7129		(27)
WT-E-01	33.5500	7.8600	25.6900	0.2000	5.1380		(29a)
WT-I-01	26.6400	2.1200	24.5200	0.2890	7.0861		(29a)
Flat Roof	58.2200		58.2200	0.1500	8.7330		(30)
Total net area of external elements Aum(A, m2)			118.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.7900	(33)
Party Wall 1					14.8800	0.0000	(32)
Party Floor 1					58.2200		(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3437 (36)
Total fabric heat loss							(33) + (36) = 41.1337 (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	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551	23.0551 (38)
Heat transfer coeff	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888	64.1888 (39)
Average = Sum(39)m / 12 =												64.1888 (39)
HLP	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025	1.1025 (40)
HLP (average)												1.1025 (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												1.9309 (42)
Average daily hot water use (litres/day)												80.0585 (43)
Daily hot water use	88.0644	84.8620	81.6597	78.4574	75.2550	72.0527	72.0527	75.2550	78.4574	81.6597	84.8620	88.0644 (44)
Energy conte	130.5969	114.2209	117.8657	102.7582	98.5989	85.0834	78.8423	90.4727	91.5532	106.6964	116.4675	126.4761 (45)
Energy content (annual)												Total = Sum(45)m = 1259.6323 (45)
Distribution loss (46)m = 0.15 x (45)m	19.5895	17.1331	17.6799	15.4137	14.7898	12.7625	11.8263	13.5709	13.7330	16.0045	17.4701	18.9714 (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	14.0326	12.6579	13.9876	13.5063	13.9346	13.4599	13.8929	13.9200	13.4852	13.9657	13.5500	(61)
Total heat required for water heating calculated for each month												
	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	(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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	(64)
								Total per year (kWh/year) = Sum(64)m =				1424.0488 (64)
Heat gains from water heating, kWh/month												
	46.9316	41.1429	42.6872	37.5437	36.2678	31.6552	29.6883	33.5622	33.8127	38.9680	42.1129	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531	115.8531 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.5956	36.0567	29.3233	22.1996	16.5945	14.0097	15.1380	19.6770	26.4104	33.5341	39.1392	41.7239 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.3977	254.0064	247.4325	233.4375	215.7713	199.1675	188.0752	185.4664	192.0403	206.0354	223.7016	240.3054 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162	48.5162 (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)	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354	-77.2354 (71)
Water heating gains (Table 5)	63.0801	61.2246	57.3753	52.1440	48.7471	43.9656	39.9036	45.1104	46.9621	52.3763	58.4902	61.2356 (72)
Total internal gains	445.2074	441.4216	424.2650	397.9150	371.2467	347.2767	333.2507	340.3877	355.5468	382.0796	411.4649	433.3988 (73)

[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		
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Southeast				7.8600	36.7938		0.4500		0.0000		0.7700		100.2076 (77)
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Solar gains	100.2076	170.6907	233.5464	289.3753	324.1245	321.7806	310.2308	284.3064	252.8814	188.6496	120.0257	85.7569	(83)
Total gains	545.4150	612.1123	657.8115	687.2903	695.3712	669.0573	643.4815	624.6941	608.4281	570.7292	531.4906	519.1556	(84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869	62.9869
alpha	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991	5.1991
util living area	0.9851	0.9721	0.9454	0.8853	0.7686	0.5943	0.4355	0.4675	0.6838	0.8967	0.9715	0.9883 (86)
MIT	20.1300	20.2867	20.4974	20.7263	20.8983	20.9785	20.9964	20.9948	20.9563	20.7465	20.3884	20.0801 (87)
Th 2	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988	19.9988 (88)
util rest of house	0.9807	0.9641	0.9298	0.8534	0.7106	0.5096	0.3382	0.3685	0.6012	0.8610	0.9618	0.9847 (89)
MIT 2	19.2295	19.3820	19.5841	19.7939	19.9360	19.9897	19.9979	19.9974	19.9779	19.8167	19.4833	19.1805 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4483 (91)
MIT	19.6332	19.7876	19.9935	20.2119	20.3674	20.4330	20.4455	20.4446	20.4165	20.2335	19.8891	19.5838 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4832	19.6376	19.8435	20.0619	20.2174	20.2830	20.2955	20.2946	20.2665	20.0835	19.7391	19.4338 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9779	0.9606	0.9270	0.8556	0.7241	0.5344	0.3673	0.3981	0.6244	0.8645	0.9587	0.9822 (94)
Useful gains	533.3392	588.0204	609.7678	588.0471	503.5262	357.5331	236.3753	248.6999	379.9186	493.3717	509.5646	509.9172 (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	974.5905	945.9885	856.5064	716.4677	546.7238	364.7855	237.2129	249.9866	395.8210	608.7364	811.2869	977.8407 (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	328.2910	240.5545	183.5736	92.4628	32.1390	0.0000	0.0000	0.0000	0.0000	85.8313	217.2401	348.1350 (98)
Space heating												1528.2274 (98)
Space heating per m2										(98) / (4) =		26.2492 (99)

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1688.6491	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	328.2910	240.5545	183.5736	92.4628	32.1390	0.0000	0.0000	0.0000	0.0000	85.8313	217.2401	348.1350	(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)	362.7525	265.8061	202.8437	102.1689	35.5127	0.0000	0.0000	0.0000	0.0000	94.8413	240.0443	384.6796	(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	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	140.5000	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.4967	89.3688	89.1342	88.6892	87.9912	87.3000	87.3000	87.3000	87.3000	88.6022	89.2748	89.5561	(217)
Fuel for water heating, kWh/month													
	161.6031	141.9721	147.9266	131.0921	127.8919	112.8790	106.2259	119.5792	120.3189	136.1840	145.6374	156.8849	(219)
Water heating fuel used												1608.1951	(219)
Annual totals kWh/year													
Space heating fuel - main system												1688.6491	(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)												31.3661	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												106.3661	(231)
Electricity for lighting (calculated in Appendix L)												286.7727	(232)
Total delivered energy for all uses												3689.9830	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1688.6491	3.4800	58.7650 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1608.1951	3.4800	55.9652 (247)
Mechanical ventilation fans	31.3661	13.1900	4.1372 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	286.7727	13.1900	37.8253 (250)
Additional standing charges			120.0000 (251)
Total energy cost			286.5852 (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] = 1.1661 (257)
SAP value	83.7328
SAP rating (Section 12)	84 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1688.6491	0.2160	364.7482 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1608.1951	0.2160	347.3701 (264)
Space and water heating			712.1183 (265)
Pumps and fans	106.3661	0.5190	55.2040 (267)
Energy for lighting	286.7727	0.5190	148.8350 (268)
Total kg/year			916.1574 (272)
CO2 emissions per m2			15.7400 (273)
EI value			88.1065
EI rating			88 (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	$3.48 / 0.8844 = 3.935$, stars = 4
Water heating environmental impact	$0.216 / 0.8844 = 0.2442$, 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	58.2200 (1b)	x 2.4000 (2b)	= 139.7280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 139.7280 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =									0.0000 / (5) = 0.0000 (8)			
Pressure test									Yes			
Measured/design AP50									4.3000			
Infiltration rate									0.2150 (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) =								0.1666 (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	0.1750	0.1666	0.1666	0.1541	0.1541	0.1375	0.1416	0.1333	0.1375	0.1458	0.1458	0.1583 (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)			7.8600	1.2357	9.7129		(27)
WT-E-01	33.5500	7.8600	25.6900	0.2000	5.1380		(29a)
WT-I-01	26.6400	2.1200	24.5200	0.2890	7.0861		(29a)
Flat Roof	58.2200		58.2200	0.1500	8.7330		(30)
Total net area of external elements Aum(A, m2)			118.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	32.7900		(33)
Party Wall 1			14.8800	0.0000	0.0000		(32)
Party Floor 1			58.2200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3437 (36)
Total fabric heat loss							(33) + (36) = 41.1337 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9309 (42)
Average daily hot water use (litres/day)												80.0585 (43)
Daily hot water use	Jan 88.0644	Feb 84.8620	Mar 81.6597	Apr 78.4574	May 75.2550	Jun 72.0527	Jul 72.0527	Aug 75.2550	Sep 78.4574	Oct 81.6597	Nov 84.8620	Dec 88.0644 (44)
Energy conte	130.5969	114.2209	117.8657	102.7582	98.5989	85.0834	78.8423	90.4727	91.5532	106.6964	116.4675	126.4761 (45)
Energy content (annual)												Total = Sum(45)m = 1259.6323 (45)
Distribution loss (46)m = 0.15 x (45)m	19.5895	17.1331	17.6799	15.4137	14.7898	12.7625	11.8263	13.5709	13.7330	16.0045	17.4701	18.9714 (46)

Southern Energy
Consultants
Energy & Sustainability Solutions

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	14.0326	12.6579	13.9876	13.5063	13.9346	13.4599	13.8929	13.9200	13.4852	13.9657	13.5500	(61)
Total heat required for water heating calculated for each month												
	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	(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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	(64)
								Total per year (kWh/year) = Sum(64)m =				1424.0488 (64)
Heat gains from water heating, kWh/month												
	46.9316	41.1429	42.6872	37.5437	36.2678	31.6552	29.6883	33.5622	33.8127	38.9680	42.1129	(65)

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												1418.5665 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	290.0958	217.0054	154.6969	66.4053	15.7410	0.0000	0.0000	0.0000	0.0000	56.5437	176.6105	306.7041 (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)	320.5479	239.7849	170.9358	73.3760	17.3933	0.0000	0.0000	0.0000	0.0000	62.4792	195.1498	338.8996 (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	144.6295	126.8788	131.8533	116.2645	112.5336	98.5433	92.7352	104.3926	105.0384	120.6621	130.0175	140.5000 (64)
Efficiency of water heater (217)m	89.4097	89.2924	88.9989	88.4368	87.6804	87.3000	87.3000	87.3000	87.3000	88.2962	89.1149	87.3000 (216)
Fuel for water heating, kWh/month	161.7605	142.0937	148.1516	131.4663	128.3451	112.8790	106.2259	119.5792	120.3189	136.6560	145.8987	157.0365 (219)
Water heating fuel used												1610.4112 (219)
Annual totals kWh/year												
Space heating fuel - main system												1418.5665 (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)												31.3661 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												106.3661 (231)
Electricity for lighting (calculated in Appendix L)												286.7727 (232)
Total delivered energy for all uses												3422.1166 (238)

10a. Fuel costs - using BEDF prices (490)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1418.5665	3.6300	51.4940 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1610.4112	3.6300	58.4579 (247)
Mechanical ventilation fans	31.3661	19.4400	6.0976 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	286.7727	19.4400	55.7486 (250)
Additional standing charges			95.0000 (251)
Total energy cost			281.3781 (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	1418.5665	0.2160	306.4104 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1610.4112	0.2160	347.8488 (264)
Space and water heating			654.2592 (265)
Pumps and fans	106.3661	0.5190	55.2040 (267)
Energy for lighting	286.7727	0.5190	148.8350 (268)
Total kg/year			858.2983 (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	1418.5665	1.2200	1730.6511 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1610.4112	1.2200	1964.7017 (264)
Space and water heating			3695.3528 (265)
Pumps and fans	106.3661	3.0700	326.5441 (267)
Energy for lighting	286.7727	3.0700	880.3922 (268)
Primary energy kWh/year			4902.2891 (272)
Primary energy kWh/m2/year			84.2028 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

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

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

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 490 TEST (31 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	£76	£76	£0
Mains gas	£205	£205	£0
Space heating	£167	£167	£0
Water heating	£58	£58	£0
Lighting	£56	£56	£0
Total cost of fuels	£281	£281	£0
Total cost of uses	£281	£281	£0
Delivered energy	59 kWh/m²	59 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	84 kWh/m²	84 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	North West
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	276.66 (P1)
Transmission heat loss coefficient	41.13 (37)
Summer heat loss coefficient	317.80 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
South East	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
South East	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
South East	7.8600	119.9223	0.4500 0.0000
total:			0.9000 381.7488

	Jun	Jul	Aug	
Solar gains	401	382	356	(P4)
Internal gains	344	330	337	
Total summer gains	745	712	694	(P5)
Summer gain/loss ratio	2.34	2.24	2.18	(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	18.59	20.39	20.23	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			