

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026I_061_As_Built				Issued on Date	07/05/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	85 B	DER	15.97	TER	18.29	
Environmental	90 B	% DER<TER	12.69			
CO ₂ Emissions (t/year)	0.70	DFEE	34.71	TFEE	42.13	
General Requirements Compliance	Pass	% DFEE<TFEE	17.62			
Assessor Details	Mr. Robert Price, Robert Price, Tel: 01635 261582, keith@southernenergyconsultants.co.uk				Assessor ID	P865-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 53 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.29 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.97 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.7 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.45 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

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

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.5 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.4500
Infiltration rate					0.1725 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1466 (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	0.1869	0.1833	0.1796	0.1613	0.1576	0.1393	0.1393	0.1356	0.1466	0.1576	0.1650	0.1723 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Total net area of external elements Aum(A, m2)			57.5500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8034		(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Party Ceilings 1			52.5500				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5794 (36)
Total fabric heat loss						(33) + (36) =	32.3828 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098 (38)
Average = Sum(39)m / 12 =	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												1.7653 (42)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy content (annual)	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (46)

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983	(61)
Total heat required for water heating calculated for each month	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
Heat gains from water heating, kWh/month	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871	(65)
Solar input (sum of months) = Sum (63)m = 0.0000 (63)													
Total per year (kWh/year) = Sum (64)m = 1361.9366 (64)													

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7133	12.1800	9.9054	7.4991	5.6056	4.7325	5.1136	6.6469	8.9215	11.3279	13.2213	14.0944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	280.2488	278.5479	268.5905	252.6454	236.7108	221.1302	210.8608	215.7482	223.8064	239.9253	258.4432	272.0878	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				2.6200	10.6334		0.4500		0.0000		0.7700		9.6533 (74)
East				5.5000	19.6403		0.4500		0.0000		0.7700		37.4294 (76)
South				3.8000	46.7521		0.4500		0.0000		0.7700		61.5584 (78)
Solar gains	108.6412	192.4848	280.3532	371.3607	434.6063	438.8011	420.0614	372.3287	312.0855	217.5819	131.5465	92.0198	(83)
Total gains	388.8900	471.0327	548.9437	624.0062	671.3172	659.9313	630.9222	588.0769	535.8919	457.5072	389.9896	364.1076	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055		
alpha	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737		
util living area	0.9943	0.9836	0.9515	0.8607	0.6960	0.5095	0.3700	0.4142	0.6563	0.9158	0.9864	0.9960	(86)	
MIT	20.0804	20.2794	20.5436	20.8047	20.9497	20.9924	20.9989	20.9980	20.9720	20.7540	20.3498	20.0266	(87)	
Th 2	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	(88)	
util rest of house	0.9926	0.9787	0.9377	0.8265	0.6391	0.4386	0.2926	0.3318	0.5794	0.8857	0.9815	0.9947	(89)	
MIT 2	19.2427	19.4387	19.6932	19.9291	20.0432	20.0700	20.0729	20.0726	20.0599	19.8922	19.5098	19.1893	(90)	
Living area fraction	19.6173	19.8146	20.0735	20.3206	20.4486	20.4825	20.4870	20.4865	20.4677	20.2776	19.8855	19.5637	(91)	
MIT	19.6173	19.8146	20.0735	20.3206	20.4486	20.4825	20.4870	20.4865	20.4677	20.2776	19.8855	19.5637	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.4673	19.6646	19.9235	20.1706	20.2986	20.3325	20.3370	20.3365	20.3177	20.1276	19.7355	19.4137	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9911	0.9760	0.9351	0.8304	0.6535	0.4587	0.3147	0.3553	0.6004	0.8877	0.9792	0.9936	(94)
Useful gains	385.4127	459.7289	513.3013	518.1742	438.7134	302.6934	198.5635	208.9636	321.7664	406.1285	381.8840	361.7598	(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	806.7899	785.3699	714.0306	599.5142	457.3824	304.9258	198.7815	209.3908	330.7379	506.7976	672.1130	809.2591	(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	313.5047	218.8308	149.3426	58.5648	13.8897	0.0000	0.0000	0.0000	0.0000	74.8978	208.9649	332.9395	(98)
Space heating												1370.9347	(98)
Space heating per m2											(98) / (4) =	26.0882	(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													1514.8450 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	313.5047	218.8308	149.3426	58.5648	13.8897	0.0000	0.0000	0.0000	0.0000	74.8978	208.9649	332.9395	(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)	346.4140	241.8020	165.0194	64.7125	15.3478	0.0000	0.0000	0.0000	0.0000	82.7600	230.9004	367.8889	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
Efficiency of water heater (217)m	89.4964	89.3326	89.0067	88.3781	87.6541	87.3000	87.3000	87.3000	87.3000	88.5321	89.2796	87.3000	(216)
Fuel for water heating, kWh/month	154.4058	135.7238	141.6085	125.8209	122.8384	108.0751	101.7744	114.4703	115.1482	130.3490	139.1958	149.9179	(219)
Water heating fuel used												1539.3284	(219)
Annual totals kWh/year													
Space heating fuel - main system												1514.8450	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.3114 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.3114 (231)
Electricity for lighting (calculated in Appendix L)													242.1807 (232)
Total delivered energy for all uses													3399.6655 (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	1514.8450	0.2160	327.2065	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1539.3284	0.2160	332.4949	(264)
Space and water heating			659.7015	(265)
Pumps and fans	103.3114	0.5190	53.6186	(267)
Energy for lighting	242.1807	0.5190	125.6918	(268)
Total CO2, kg/year			839.0119	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.9700	(273)

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

DER			15.9700	ZC1
Total Floor Area		TFA	52.5500	
Assumed number of occupants		N	1.7653	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.3491	ZC2
CO2 emissions from cooking, equation (L16)			3.0707	ZC3
Total CO2 emissions			36.3898	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			36.3898	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1586 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4086 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3473 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4428	0.4341	0.4254	0.3820	0.3733	0.3299	0.3299	0.3212	0.3473	0.3733	0.3907	0.4081 (22b)
Effective ac	0.5980	0.5942	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross 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)			11.0100	1.3258	14.5966			(27)					
WT-E-03	50.2300	11.0100	39.2200	0.1800	7.0596			(29a)					
WT-I-02	7.3200	2.1200	5.2000	0.1800	0.9360			(29a)					
Total net area of external elements Aum(A, m2)			57.5500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.7122			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.5317 (36)					
Total fabric heat loss						(33) + (36) =		31.2439 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.8900	Feb 24.7315	Mar 24.5762	Apr 23.8468	May 23.7103	Jun 23.0750	Jul 23.0750	Aug 22.9573	Sep 23.3197	Oct 23.7103	Nov 23.9864	Dec 24.2750	(38)
Heat transfer coeff	56.1339	55.9754	55.8201	55.0907	54.9542	54.3189	54.3189	54.2012	54.5636	54.9542	55.2303	55.5189	(39)
Average = Sum(39)m / 12 =												55.0900	(39)
HLP	Jan 1.0682	Feb 1.0652	Mar 1.0622	Apr 1.0483	May 1.0458	Jun 1.0337	Jul 1.0337	Aug 1.0314	Sep 1.0383	Oct 1.0458	Nov 1.0510	Dec 1.0565	(40)
HLP (average)												1.0483	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
Daily hot water use	Jan 83.7383	Feb 80.6933	Mar 77.6483	Apr 74.6032	May 71.5582	Jun 68.5132	Jul 68.5132	Aug 71.5582	Sep 74.6032	Oct 77.6483	Nov 80.6933	Dec 83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (46)
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	42.6721	37.1410	39.5687	36.7906	36.4653	33.7873	34.9136	36.4653	36.7906	39.5687	39.7939	42.6721 (61)

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Total heat required for water heating calculated for each month												
	166.8536	145.7509	151.6444	134.5010	130.2207	114.6911	109.8828	122.4936	123.8464	141.0238	150.5401	162.9353 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Output from w/h	166.8536	145.7509	151.6444	134.5010	130.2207	114.6911	109.8828	122.4936	123.8464	141.0238	150.5401	162.9353 (64)
Total per year (kWh/year) = Sum(64)m = 1654.3836 (64)												
Heat gains from water heating, kWh/month												
	51.9584	45.3981	47.1574	41.6863	40.2900	35.3473	33.6557	37.7207	38.1437	43.6260	46.7716	50.6555 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7559	12.2179	9.9362	7.5224	5.6231	4.7472	5.1295	6.6676	8.9492	11.3631	13.2624	14.1382 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118 (71)
Water heating gains (Table 5)	69.8365	67.5566	63.3835	57.8977	54.1532	49.0935	45.2361	50.6999	52.9774	58.6371	64.9605	68.0854 (72)
Total internal gains	289.9238	287.7024	277.2245	260.7600	244.3047	228.2079	217.9445	223.3498	231.9320	248.5704	267.6047	281.7666 (73)

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

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	65.0108	65.1948	65.3762	66.2418	66.4063	67.1830	67.1830	67.3288	66.8817	66.4063	66.0743	65.7308
alpha	5.3341	5.3463	5.3584	5.4161	5.4271	5.4789	5.4789	5.4886	5.4588	5.4271	5.4050	5.3821
util living area	0.9953	0.9883	0.9682	0.9057	0.7710	0.5792	0.4244	0.4693	0.7209	0.9392	0.9893	0.9965 (86)
MIT	19.9826	20.1616	20.4191	20.7152	20.9094	20.9847	20.9976	20.9960	20.9525	20.6874	20.2776	19.9505 (87)
Th 2	20.0269	20.0294	20.0318	20.0432	20.0454	20.0554	20.0554	20.0572	20.0515	20.0454	20.0410	20.0365 (88)
util rest of house	0.9937	0.9846	0.9583	0.8780	0.7148	0.4999	0.3345	0.3753	0.6415	0.9148	0.9852	0.9954 (89)
MIT 2	18.6804	18.9414	19.3114	19.7251	19.9630	20.0459	20.0545	20.0557	20.0172	19.6998	19.1201	18.6407 (90)
Living area fraction									fLA = Living area / (4) =			0.4472 (91)
MIT	19.2627	19.4871	19.8067	20.1679	20.3862	20.4657	20.4763	20.4762	20.4354	20.1415	19.6377	19.2265 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2627	19.4871	19.8067	20.1679	20.3862	20.4657	20.4763	20.4762	20.4354	20.1415	19.6377	19.2265 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9921	0.9820	0.9555	0.8821	0.7360	0.5350	0.3748	0.4174	0.6751	0.9177	0.9831	0.9941 (94)
Useful gains	375.4538	436.4999	483.1123	496.8611	440.3670	313.3447	209.9373	219.8408	328.2319	390.7653	368.4208	354.6133 (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	839.9152	816.5172	742.7844	620.7548	477.3444	318.6188	210.5556	220.9345	345.6847	524.3430	692.4607	834.2530 (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	345.5593	255.3717	193.1960	89.2035	27.5112	0.0000	0.0000	0.0000	0.0000	99.3818	233.3088	356.8519 (98)
Space heating												1600.3842 (98)
Space heating per m2												30.4545 (99)
										(98) / (4) =		

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1713.4734 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.5593	255.3717	193.1960	89.2035	27.5112	0.0000	0.0000	0.0000	0.0000	99.3818	233.3088	356.8519	(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)	369.9778	273.4172	206.8480	95.5069	29.4552	0.0000	0.0000	0.0000	0.0000	106.4045	249.7953	382.0685	(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	166.8536	145.7509	151.6444	134.5010	130.2207	114.6911	109.8828	122.4936	123.8464	141.0238	150.5401	162.9353	(64)
Efficiency of water heater	86.8432	86.4491	85.6619	84.0443	81.8959	80.3000	80.3000	80.3000	80.3000	84.1884	86.1503	86.9710	(216)
(217)m	86.8432	86.4491	85.6619	84.0443	81.8959	80.3000	80.3000	80.3000	80.3000	84.1884	86.1503	86.9710	(217)
Fuel for water heating, kWh/month	192.1320	168.5975	177.0266	160.0358	159.0075	142.8282	136.8403	152.5449	154.2296	167.5098	174.7412	187.3444	(219)
Water heating fuel used												1972.8380	(219)
Annual totals kWh/year													
Space heating fuel - main system												1713.4734	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												242.9334	(232)
Total delivered energy for all uses												4004.2448	(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	1713.4734	0.2160	370.1103 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1972.8380	0.2160	426.1330 (264)
Space and water heating			796.2433 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	242.9334	0.5190	126.0824 (268)
Total CO2, kg/m2/year			961.2507 (272)
Emissions per m2 for space and water heating			15.1521 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3993 (272b)
Emissions per m2 for pumps and fans			0.7407 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.1521 * 1.00) + 2.3993 + 0.7407, rounded to 2 d.p.			18.2900 (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	52.5500 (1b)	x 2.4000 (2b)	= 126.1200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.1200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1586 (8)
Pressure test					Yes
Measured/design AP50					3.4500
Infiltration rate					0.3311 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2814 (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	0.3588	0.3518	0.3447	0.3096	0.3025	0.2673	0.2673	0.2603	0.2814	0.3025	0.3166	0.3307 (22b)
Effective ac	0.5644	0.5619	0.5594	0.5479	0.5458	0.5357	0.5357	0.5339	0.5396	0.5458	0.5501	0.5547 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-I-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Total net area of external elements Aum(A, m ²)			57.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.8034		(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Party Ceilings 1			52.5500				(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)							8.5794 (36)
Total fabric heat loss						(33) + (36) =	32.3828 (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	23.4889	23.3849	23.2829	22.8039	22.7143	22.2972	22.2972	22.2199	22.4578	22.7143	22.8956	23.0851 (38)
Heat transfer coeff	55.8717	55.7677	55.6657	55.1868	55.0971	54.6800	54.6800	54.6027	54.8407	55.0971	55.2784	55.4680 (39)
Average = Sum(39)m / 12 =												55.1863 (39)
HLP	1.0632	1.0612	1.0593	1.0502	1.0485	1.0405	1.0405	1.0391	1.0436	1.0485	1.0519	1.0555 (40)
HLP (average)												1.0502 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	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	26.3886	23.0796	23.8161	20.7634	19.9230	17.1921	15.9310	18.2810	18.4993	21.5592	23.5336	25.5559 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7133	12.1800	9.9054	7.4991	5.6056	4.7325	5.1136	6.6469	8.9215	11.3279	13.2213	14.0944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	35.4685	34.3447	32.0109	28.8381	26.7783	23.8778	21.4126	24.5713	25.6935	28.9774	32.6855	34.3494	(72)
Total internal gains	252.5132	251.4525	242.8211	228.6771	213.9124	199.9776	191.1051	194.2005	201.6205	215.8755	232.2885	244.9868	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.6200	10.6334	0.4500	0.0000	0.7700	9.6533 (74)
East	5.5000	19.6403	0.4500	0.0000	0.7700	37.4294 (76)
South	3.8000	46.7521	0.4500	0.0000	0.7700	61.5584 (78)

Solar gains	108.6412	192.4848	280.3532	371.3607	434.6063	438.8011	420.0614	372.3287	312.0855	217.5819	131.5465	92.0198	(83)
Total gains	361.1543	443.9373	523.1743	600.0379	648.5187	638.7786	611.1664	566.5292	513.7060	433.4575	363.8350	337.0066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.3158	65.4376	65.5575	66.1265	66.2340	66.7393	66.7393	66.8338	66.5438	66.2340	66.0168	65.7912	
alpha	5.3544	5.3625	5.3705	5.4084	5.4156	5.4493	5.4493	5.4556	5.4363	5.4156	5.4011	5.3861	
util living area	0.9962	0.9883	0.9634	0.8853	0.7307	0.5383	0.3922	0.4404	0.6938	0.9355	0.9906	0.9973	(86)
MIT	19.9590	20.1660	20.4492	20.7515	20.9298	20.9889	20.9983	20.9970	20.9599	20.6950	20.2577	19.9166	(87)
Th 2	20.0310	20.0326	20.0342	20.0417	20.0431	20.0497	20.0497	20.0509	20.0472	20.0431	20.0403	20.0373	(88)
util rest of house	0.9949	0.9846	0.9522	0.8541	0.6729	0.4626	0.3083	0.3511	0.6142	0.9100	0.9871	0.9965	(89)
MIT 2	19.0875	19.2936	19.5704	19.8553	20.0007	20.0451	20.0493	20.0501	20.0278	19.8140	19.3921	19.0505	(90)
Living area fraction									fLA = Living area / (4) =			0.4472	(91)
MIT	19.4772	19.6838	19.9634	20.2561	20.4162	20.4672	20.4737	20.4735	20.4446	20.2080	19.7792	19.4378	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4772	19.6838	19.9634	20.2561	20.4162	20.4672	20.4737	20.4735	20.4446	20.2080	19.7792	19.4378	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	358.9977	436.3797	497.6701	517.0552	451.5743	317.0273	211.3838	221.6014	333.2425	396.6455	358.6874	335.5707	(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	847.9772	824.4556	749.4497	626.7059	480.2373	320.8168	211.8141	222.4266	347.9431	529.3729	700.8865	845.2121	(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	363.8007	260.7870	187.3240	78.9485	21.3253	0.0000	0.0000	0.0000	0.0000	98.7492	246.3833	379.1732	(98)
Space heating												1636.4912	(98)
Space heating per m2												(98) / (4) =	31.1416 (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	513.9918	404.6319	414.9807	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9681	0.9863	0.9795	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	497.6163	399.0926	406.4639	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	813.1785	779.6306	728.4483	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	227.2048	283.1203	239.5564	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												749.8815 (104)
Cooled Fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	56.8012	70.7801	59.8891	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												187.4704 (107)
Space cooling per m2												3.5675 (108)
Energy for space heating												31.1416 (99)
Energy for space cooling												3.5675 (108)
Total												34.7091 (109)
Dwelling Fabric Energy Efficiency (DFEE)												34.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1586 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4086 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3473 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4428	0.4341	0.4254	0.3820	0.3733	0.3299	0.3299	0.3212	0.3473	0.3733	0.3907	0.4081 (22b)
Effective ac	0.5980	0.5942	0.5905	0.5730	0.5697	0.5544	0.5544	0.5516	0.5603	0.5697	0.5763	0.5833 (25)

3. Heat losses and heat loss parameter

Element	Gross 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)			11.0100	1.3258	14.5966		(27)					
WT-E-03	50.2300	11.0100	39.2200	0.1800	7.0596		(29a)					
WT-I-02	7.3200	2.1200	5.2000	0.1800	0.9360		(29a)					
Total net area of external elements Aum(A, m2)			57.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			24.7122	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5317 (36)					
Total fabric heat loss						(33) + (36) =	31.2439 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.8900	Feb 24.7315	Mar 24.5762	Apr 23.8468	May 23.7103	Jun 23.0750	Jul 23.0750	Aug 22.9573	Sep 23.3197	Oct 23.7103	Nov 23.9864	Dec 24.2750 (38)
Heat transfer coeff	56.1339	55.9754	55.8201	55.0907	54.9542	54.3189	54.3189	54.2012	54.5636	54.9542	55.2303	55.5189 (39)
Average = Sum(39)m / 12 =												55.0900 (39)
HLP	Jan 1.0682	Feb 1.0652	Mar 1.0622	Apr 1.0483	May 1.0458	Jun 1.0337	Jul 1.0337	Aug 1.0314	Sep 1.0383	Oct 1.0458	Nov 1.0510	Dec 1.0565 (40)
HLP (average)												1.0483 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
26.3886 23.0796 23.8161 20.7634 19.9230 17.1921 15.9310 18.2810 18.4993 21.5592 23.5336 25.5559 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647	88.2647 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7559	12.2179	9.9362	7.5224	5.6231	4.7472	5.1295	6.6676	8.9492	11.3631	13.2624	14.1382 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.8520	155.4485	151.4253	142.8606	132.0491	121.8878	115.0994	113.5029	117.5261	126.0908	136.9023	147.0636 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265	31.8265 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118 (71)
Water heating gains (Table 5)	35.4685	34.3447	32.0109	28.8381	26.7783	23.8778	21.4126	24.5713	25.6935	28.9774	32.6855	34.3494 (72)
Total internal gains	252.5558	251.4904	242.8519	228.7005	213.9298	199.9923	191.1210	194.2212	201.6482	215.9107	232.3296	245.0306 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				2.4200	10.6334	0.6300	0.7000	0.7700	7.8643 (74)			
East				5.0800	19.6403	0.6300	0.7000	0.7700	30.4918 (76)			
South				3.5100	46.7521	0.6300	0.7000	0.7700	50.1510 (78)			
Solar gains	88.5071	156.8119	228.3951	302.5354	354.0589	357.4760	342.2095	303.3237	254.2462	177.2577	107.1673	74.9661 (83)
Total gains	341.0629	408.3023	471.2470	531.2358	567.9887	557.4683	533.3305	497.5449	455.8944	393.1684	339.4969	319.9967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.0108	65.1948	65.3762	66.2418	66.4063	67.1830	67.1830	67.3288	66.8817	66.4063	66.0743	65.7308
alpha	5.3341	5.3463	5.3584	5.4161	5.4271	5.4789	5.4789	5.4886	5.4588	5.4271	5.4050	5.3821
util living area	0.9971	0.9920	0.9762	0.9226	0.7966	0.6051	0.4451	0.4954	0.7545	0.9549	0.9932	0.9979 (86)
MIT	19.9163	20.0994	20.3655	20.6786	20.8932	20.9811	20.9970	20.9948	20.9407	20.6428	20.2165	19.8848 (87)
Th 2	20.0269	20.0294	20.0318	20.0432	20.0454	20.0554	20.0554	20.0572	20.0515	20.0454	20.0410	20.0365 (88)
util rest of house	0.9961	0.9894	0.9684	0.8982	0.7422	0.5236	0.3512	0.3969	0.6761	0.9355	0.9905	0.9972 (89)
MIT 2	19.0417	19.2254	19.4888	19.7943	19.9779	20.0473	20.0546	20.0558	20.0214	19.7698	19.3523	19.0182 (90)
Living area fraction									fLA = Living area / (4) =			0.4472 (91)
MIT	19.4328	19.6162	19.8808	20.1898	20.3872	20.4649	20.4761	20.4757	20.4325	20.1602	19.7387	19.4057 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4328	19.6162	19.8808	20.1898	20.3872	20.4649	20.4761	20.4757	20.4325	20.1602	19.7387	19.4057 (93)

8. Space heating requirement

Utilisation	0.9954	0.9880	0.9670	0.9024	0.7629	0.5597	0.3933	0.4411	0.7094	0.9382	0.9895	0.9966 (94)
Useful gains	339.4878	403.4140	455.6724	479.3958	433.3122	312.0361	209.7591	219.4774	323.4130	368.8804	335.9175	318.9212 (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	849.4613	823.7478	746.9201	621.9605	477.4007	318.5751	210.5438	220.9102	345.5240	525.3736	698.0405	844.2044 (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	379.4203	282.4643	216.6883	102.6466	32.8019	0.0000	0.0000	0.0000	0.0000	116.4310	260.7286	390.8107 (98)
Space heating												1781.9917 (98)
Space heating per m2										(98) / (4) =		33.9104 (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	510.5975	401.9597	411.9294	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9499	0.9775	0.9680	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	485.0225	392.9240	398.7339	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	718.1600	688.6747	647.8447	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.8590	220.0385	185.3384	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												573.2360 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			

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	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	41.9648	55.0096	46.3346	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												143.3090 (107)
Energy for space heating												2.7271 (108)
Energy for space cooling												33.9104 (99)
Total												2.7271 (108)
Target Fabric Energy Efficiency (TFEE)												36.6375 (109)
												42.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.4500
Number of sides sheltered					0.1725 (18)
					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1466 (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	0.1540	0.1466	0.1466	0.1356	0.1356	0.1210	0.1246	0.1173	0.1210	0.1283	0.1283	0.1393 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-T-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Total net area of external elements Aum(A, m ²)			57.5500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8034		(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Party Ceilings 1			52.5500				(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)							8.5794 (36)
Total fabric heat loss						(33) + (36) =	32.3828 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098 (38)
Heat transfer coeff	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926 (39)
Average = Sum(39)m / 12 =												53.1926 (39)
HLP	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122 (40)
HLP (average)												1.0122 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983	(61)
Total heat required for water heating calculated for each month	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2832	30.4500	24.7636	18.7477	14.0141	11.8313	12.7841	16.6173	22.3037	28.3197	33.0532	35.2360	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.6298	232.0126	226.0080	213.2247	197.0882	181.9221	171.7902	169.4074	175.4120	188.1953	204.3318	219.4979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	409.7801	406.5656	391.2148	367.4417	343.3419	321.4468	308.4056	314.8065	328.2581	352.2051	378.8882	398.8472	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				2.6200	11.9814	0.4500	0.0000	0.7700	10.8771 (74)			
East				5.5000	22.3313	0.4500	0.0000	0.7700	42.5579 (76)			
South				3.8000	50.9848	0.4500	0.0000	0.7700	67.1317 (78)			
Solar gains	120.5667	192.4263	277.5571	380.3235	434.9712	470.5999	445.3831	402.7065	335.3901	232.4293	149.5975	101.1139 (83)
Total gains	530.3468	598.9920	668.7719	747.7652	778.3131	792.0467	753.7887	717.5130	663.6482	584.6344	528.4856	499.9611 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055		
alpha	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737		
util living area	0.9710	0.9462	0.8791	0.7331	0.5380	0.3353	0.2187	0.2372	0.4614	0.7746	0.9365	0.9775	(86)	
MIT	20.3936	20.5373	20.7516	20.9226	20.9875	20.9993	21.0000	20.9999	20.9957	20.9136	20.6396	20.3454	(87)	
Th 2	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	(88)	
util rest of house	0.9628	0.9322	0.8512	0.6862	0.4790	0.2734	0.1533	0.1685	0.3893	0.7204	0.9173	0.9709	(89)	
MIT 2	19.5491	19.6854	19.8810	20.0218	20.0669	20.0729	20.0731	20.0731	20.0716	20.0190	19.7845	19.5029	(90)	
Living area fraction	19.9268	20.0664	20.2703	20.4246	20.4786	20.4872	20.4876	20.4876	20.4849	20.4190	20.1669	19.8797	(92)	
Temperature adjustment	19.7768	19.9164	20.1203	20.2746	20.3286	20.3372	20.3376	20.3376	20.3349	20.2690	20.0169	-0.1500		
adjusted MIT												19.7297	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9597	0.9295	0.8528	0.6969	0.4955	0.2911	0.1720	0.1881	0.4098	0.7325	0.9159	0.9679	(94)
Ext temp.	508.9529	556.7332	570.3183	521.0886	385.6588	230.5373	129.6569	134.9714	271.9937	428.2709	484.0514	483.9053	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Month fracti	780.6959	761.5255	676.6267	551.8544	389.8279	230.7063	129.6628	134.9813	273.1376	461.1283	639.2114	778.1908	(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	202.1768	137.6204	79.0934	22.1514	3.1019	0.0000	0.0000	0.0000	0.0000	24.4459	111.7152	218.9484	(98)
RHI space heating demand												799.2535	(98)
												799	(98)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.4500
Infiltration rate					0.1725 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1466 (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	0.1869	0.1833	0.1796	0.1613	0.1576	0.1393	0.1393	0.1356	0.1466	0.1576	0.1650	0.1723 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-T-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Total net area of external elements Aum(A, m ²)					57.5500		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.8034		(33)
Party Wall 1				20.8800	0.0000		(32)
Party Floor 1				52.5500			(32d)
Party Ceilings 1				52.5500			(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)							8.5794 (36)
Total fabric heat loss							(33) + (36) = 32.3828 (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	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098 (38)
Heat transfer coeff	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926 (39)
Average = Sum(39)m / 12 =												53.1926 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122 (40)
HLP (average)												1.0122 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)												Total = Sum(45)m = 1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983 (61)
Total heat required for water heating calculated for each month												
	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Output from w/h	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614 (64)
Total per year (kWh/year) = Sum(64)m = 1361.9366 (64)												
Heat gains from water heating, kWh/month												
	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2832	30.4500	24.7636	18.7477	14.0141	11.8313	12.7841	16.6173	22.3037	28.3197	33.0532	35.2360	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.6298	232.0126	226.0080	213.2247	197.0882	181.9221	171.7902	169.4074	175.4120	188.1953	204.3318	219.4979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	409.7801	406.5656	391.2148	367.4417	343.3419	321.4468	308.4056	314.8065	328.2581	352.2051	378.8882	398.8472	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			2.6200		10.6334		0.4500		0.0000		0.7700		9.6533 (74)
East			5.5000		19.6403		0.4500		0.0000		0.7700		37.4294 (76)
South			3.8000		46.7521		0.4500		0.0000		0.7700		61.5584 (78)
Solar gains	108.6412	192.4848	280.3532	371.3607	434.6063	438.8011	420.0614	372.3287	312.0855	217.5819	131.5465	92.0198	(83)
Total gains	518.4212	599.0504	671.5680	738.8025	777.9482	760.2479	728.4669	687.1352	640.3436	569.7870	510.4346	490.8670	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055		
alpha	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737		
util living area	0.9787	0.9547	0.9000	0.7839	0.6163	0.4450	0.3209	0.3554	0.5619	0.8351	0.9570	0.9837	(86)	
MIT	20.3017	20.4785	20.6941	20.8818	20.9721	20.9961	20.9995	20.9991	20.9867	20.8581	20.5401	20.2470	(87)	
Th 2	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	(88)	
util rest of house	0.9727	0.9430	0.8768	0.7430	0.5613	0.3818	0.2535	0.2842	0.4911	0.7913	0.9438	0.9790	(89)	
MIT 2	19.4595	19.6292	19.8291	19.9899	20.0572	20.0716	20.0730	20.0729	20.0672	19.9760	19.6912	19.4063	(90)	
Living area fraction	19.8361	20.0090	20.2159	20.3887	20.4663	20.4850	20.4873	20.4871	20.4784	20.3705	20.0708	0.4472	(91)	
MIT	19.8361	20.0090	20.2159	20.3887	20.4663	20.4850	20.4873	20.4871	20.4784	20.3705	20.0708	19.7823	(92)	
Temperature adjustment	19.6861	19.8590	20.0659	20.2387	20.3163	20.3350	20.3373	20.3371	20.3284	20.2205	19.9208	-0.1500	(93)	
adjusted MIT	19.6861	19.8590	20.0659	20.2387	20.3163	20.3350	20.3373	20.3371	20.3284	20.2205	19.9208	19.6323	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9697	0.9399	0.8766	0.7507	0.5761	0.3998	0.2728	0.3045	0.5110	0.7989	0.9412	0.9763	(94)
Useful gains	502.7276	563.0561	588.7038	554.6002	448.1438	303.9321	198.6947	209.2307	327.1896	455.1914	480.4275	479.2377	(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	818.4286	795.7078	721.6047	603.1369	458.3242	305.0601	198.7986	209.4245	331.3055	511.7384	681.9727	820.8825	(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	234.8816	156.3419	98.8783	34.9464	7.5742	0.0000	0.0000	0.0000	0.0000	42.0709	145.1126	254.1838	(98)
Space heating												973.9897	(98)
Space heating per m2											(98) / (4) =	18.5345	(99)

8c. Space cooling requirement

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													1076.2317 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	234.8816	156.3419	98.8783	34.9464	7.5742	0.0000	0.0000	0.0000	0.0000	42.0709	145.1126	254.1838	(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)	259.5377	172.7535	109.2578	38.6148	8.3693	0.0000	0.0000	0.0000	0.0000	46.4872	160.3454	280.8660	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
Efficiency of water heater (217)m	89.2877	89.0739	88.6785	88.0444	87.5033	87.3000	87.3000	87.3000	87.3000	88.1326	88.9951	87.3000	(216)
Fuel for water heating, kWh/month	154.7667	136.1179	142.1328	126.2977	123.0501	108.0751	101.7744	114.4703	115.1482	130.9399	139.6407	150.2347	(219)
Water heating fuel used												1542.6487	(219)
Annual totals kWh/year													
Space heating fuel - main system												1076.2317	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.3114 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.3114 (231)
Electricity for lighting (calculated in Appendix L)													242.1807 (232)
Total delivered energy for all uses													2964.3725 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1076.2317	3.4800	37.4529 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1542.6487	3.4800	53.6842 (247)
Mechanical ventilation fans	28.3114	13.1900	3.7343 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	242.1807	13.1900	31.9436 (250)
Additional standing charges			120.0000 (251)
Total energy cost			256.7074 (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] =	1.1052 (257)
SAP value		84.5818
SAP rating (Section 12)		85 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1076.2317	0.2160	232.4661 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1542.6487	0.2160	333.2121 (264)
Space and water heating			565.6782 (265)
Pumps and fans	103.3114	0.5190	53.6186 (267)
Energy for lighting	242.1807	0.5190	125.6918 (268)
Total kg/year			744.9886 (272)
CO2 emissions per m2			14.1800 (273)
EI value			89.7664
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	$3.48 / 0.8819 = 3.946$, stars = 4
Water heating environmental impact	$0.216 / 0.8819 = 0.2449$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.4500
Number of sides sheltered					0.1725 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1466 (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	0.1540	0.1466	0.1466	0.1356	0.1356	0.1210	0.1246	0.1173	0.1210	0.1283	0.1283	0.1393 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			11.9200	1.2357	14.7300		(27)
WT-E-03	50.2300	11.9200	38.3100	0.1600	6.1296		(29a)
WT-T-02	7.3200	2.1200	5.2000	0.1584	0.8238		(29a)
Total net area of external elements Aum(A, m ²)			57.5500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8034		(33)
Party Wall 1			20.8800	0.0000	0.0000		(32)
Party Floor 1			52.5500				(32d)
Party Ceilings 1			52.5500				(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)							8.5794 (36)
Total fabric heat loss						(33) + (36) =	32.3828 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098	20.8098 (38)
Heat transfer coeff	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926	53.1926 (39)
Average = Sum(39)m / 12 =												53.1926 (39)
HLP	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122	1.0122 (40)
HLP (average)												1.0122 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7653 (42)
Average daily hot water use (litres/day)												76.1257 (43)
Daily hot water use	83.7383	80.6933	77.6483	74.6032	71.5582	68.5132	68.5132	71.5582	74.6032	77.6483	80.6933	83.7383 (44)
Energy conte	124.1815	108.6099	112.0757	97.7103	93.7554	80.9038	74.9692	86.0283	87.0557	101.4551	110.7462	120.2631 (45)
Energy content (annual)										Total = Sum(45)m =		1197.7543 (45)
Distribution loss (46)m = 0.15 x (45)m	18.6272	16.2915	16.8114	14.6565	14.0633	12.1356	11.2454	12.9042	13.0584	15.2183	16.6119	18.0395 (46)

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	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0061	12.6356	13.9654	13.4877	13.9176	13.4458	13.8798	13.9043	13.4687	13.9456	13.5273	13.9983	13.9983	(61)
Total heat required for water heating calculated for each month	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	134.2614	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	134.2614	(64)
Heat gains from water heating, kWh/month	44.7919	39.2717	40.7565	35.8606	34.6531	30.2620	28.3972	32.0805	32.3132	37.2202	40.2049	43.4871	43.4871	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	105.9177	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.2832	30.4500	24.7636	18.7477	14.0141	11.8313	12.7841	16.6173	22.3037	28.3197	33.0532	35.2360	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.6298	232.0126	226.0080	213.2247	197.0882	181.9221	171.7902	169.4074	175.4120	188.1953	204.3318	219.4979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	47.3571	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	-70.6118	(71)
Water heating gains (Table 5)	60.2041	58.4400	54.7803	49.8064	46.5767	42.0305	38.1683	43.1189	44.8794	50.0272	55.8402	58.4504	(72)
Total internal gains	409.7801	406.5656	391.2148	367.4417	343.3419	321.4468	308.4056	314.8065	328.2581	352.2051	378.8882	398.8472	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
North				2.6200	11.9814	0.4500	0.0000	0.7700	10.8771 (74)				
East				5.5000	22.3313	0.4500	0.0000	0.7700	42.5579 (76)				
South				3.8000	50.9848	0.4500	0.0000	0.7700	67.1317 (78)				
Solar gains	120.5667	192.4263	277.5571	380.3235	434.9712	470.5999	445.3831	402.7065	335.3901	232.4293	149.5975	101.1139	(83)
Total gains	530.3468	598.9920	668.7719	747.7652	778.3131	792.0467	753.7887	717.5130	663.6482	584.6344	528.4856	499.9611	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	68.6055	
alpha	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	5.5737	
util living area	0.9710	0.9462	0.8791	0.7331	0.5380	0.3353	0.2187	0.2372	0.4614	0.7746	0.9365	0.9775	(86)
MIT	20.3936	20.5373	20.7516	20.9226	20.9875	20.9993	21.0000	20.9999	20.9957	20.9136	20.6396	20.3454	(87)
Th 2	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	20.0732	(88)
util rest of house	0.9628	0.9322	0.8512	0.6862	0.4790	0.2734	0.1533	0.1685	0.3893	0.7204	0.9173	0.9709	(89)
MIT 2	19.5491	19.6854	19.8810	20.0218	20.0669	20.0729	20.0731	20.0731	20.0716	20.0190	19.7845	19.5029	(90)
Living area fraction	19.9268	20.0664	20.2703	20.4246	20.4786	20.4872	20.4876	20.4876	20.4849	20.4190	20.1669	0.4472	(91)
MIT	19.9268	20.0664	20.2703	20.4246	20.4786	20.4872	20.4876	20.4876	20.4849	20.4190	20.1669	19.8797	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7768	19.9164	20.1203	20.2746	20.3286	20.3372	20.3376	20.3376	20.3349	20.2690	20.0169	19.7297	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	508.9529	556.7332	570.3183	521.0886	385.6588	230.5373	129.6569	134.9714	271.9937	428.2709	484.0514	483.9053	(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	780.6959	761.5255	676.6267	551.8544	389.8279	230.7063	129.6628	134.9813	273.1376	461.1283	639.2114	778.1908	(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	202.1768	137.6204	79.0934	22.1514	3.1019	0.0000	0.0000	0.0000	0.0000	24.4459	111.7152	218.9484	(98)
Space heating												799.2535	(98)
Space heating per m2												15.2094	(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													883.1530 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	202.1768	137.6204	79.0934	22.1514	3.1019	0.0000	0.0000	0.0000	0.0000	24.4459	111.7152	218.9484	(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)	223.3998	152.0668	87.3960	24.4766	3.4275	0.0000	0.0000	0.0000	0.0000	27.0120	123.4422	241.9320	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	138.1876	121.2455	126.0411	111.1981	107.6730	94.3496	88.8491	99.9326	100.5244	115.4007	124.2734	134.2614	(64)
Efficiency of water heater (217)m	89.1729	88.9725	88.5066	87.8158	87.3865	87.3000	87.3000	87.3000	87.3000	87.8430	88.7862	87.3000	(216)
Fuel for water heating, kWh/month	154.9659	136.2731	142.4087	126.6265	123.2146	108.0751	101.7744	114.4703	115.1482	131.3716	139.9694	150.4222	(219)
Water heating fuel used												1544.7201	(219)
Annual totals kWh/year													
Space heating fuel - main system												883.1530	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.3114 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.3114 (231)
Electricity for lighting (calculated in Appendix L)													242.1807 (232)
Total delivered energy for all uses													2773.3652 (238)

10a. Fuel costs - using BEDF prices (476)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	883.1530	3.8700	34.1780 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1544.7201	3.8700	59.7807 (247)
Mechanical ventilation fans	28.3114	18.9000	5.3509 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	242.1807	18.9000	45.7721 (250)
Additional standing charges			93.0000 (251)
Total energy cost			252.2567 (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	883.1530	0.2160	190.7611 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1544.7201	0.2160	333.6595 (264)
Space and water heating			524.4206 (265)
Pumps and fans	103.3114	0.5190	53.6186 (267)
Energy for lighting	242.1807	0.5190	125.6918 (268)
Total kg/year			703.7310 (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	883.1530	1.2200	1077.4467 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1544.7201	1.2200	1884.5585 (264)
Space and water heating			2962.0052 (265)
Pumps and fans	103.3114	3.0700	317.1661 (267)
Energy for lighting	242.1807	3.0700	743.4947 (268)
Primary energy kWh/year			4022.6659 (272)
Primary energy kWh/m2/year			76.5493 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	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 85	
Potential environmental impact rating:			B 90

Fuel prices for cost data on this page from database revision number 476 TEST (01 Apr 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£65	£65	£0
Mains gas	£187	£187	£0
Space heating	£147	£147	£0
Water heating	£60	£60	£0
Lighting	£46	£46	£0
Total cost of fuels	£252	£252	£0
Total cost of uses	£253	£253	£0
Delivered energy	53 kWh/m²	53 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	77 kWh/m²	77 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

No improvements selected / applicable

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Built) 9.92

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	249.72 (P1)
Transmission heat loss coefficient	32.38 (37)
Summer heat loss coefficient	282.10 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	1.000	0.90	1.000	0.900 (P8)
East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	2.6200	81.1852	0.4500	0.0000	0.9000	86.1456
East	5.5000	117.5071	0.4500	0.0000	0.9000	261.7470
South	3.8000	112.2060	0.4500	0.0000	0.9000	172.6850
total:						520.5776

	Jun	Jul	Aug	
Solar gains	550	521	471	(P4)
Internal gains	318	305	312	
Total summer gains	868	826	783	(P5)
Summer gain/loss ratio	3.08	2.93	2.77	(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	19.33	21.08	20.82	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			