

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025k_078_As_Built				Issued on Date	24/01/2022
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	85 B	DER	15.60	TER	16.90	
Environmental	90 B	% DER<TER	7.67			
CO ₂ Emissions (t/year)	0.73	DFEE	31.82	TFEE	34.34	
General Requirements Compliance	Pass	% DFEE<TFEE	7.33			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 57 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) 16.90 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.60 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 34.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 31.8 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.29 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.92 (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 East: 6.42 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 3.9 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	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (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					3.9200
Infiltration rate					0.1960 (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) =				0.1519 (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	0.1937	0.1899	0.1861	0.1671	0.1633	0.1443	0.1443	0.1405	0.1519	0.1633	0.1709	0.1785 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Total net area of external elements Aum(A, m2)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.2288		(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Party Ceilings 1			56.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2819 (36)
Total fabric heat loss						(33) + (36) =	25.5107 (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	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492 (38)
Average = Sum(39)m / 12 =	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460 (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												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)												Total = Sum(45)m = 1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (46)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169	(61)
Total heat required for water heating calculated for each month	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Heat gains from water heating, kWh/month	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060	(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	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4900	14.6463	11.9111	9.0175	6.7407	5.6908	6.1491	7.9928	10.7279	13.6216	15.8984	16.9483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.5289	166.2362	161.9339	152.7747	141.2129	130.3465	123.0870	121.3797	125.6821	134.8412	146.4030	157.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	62.3123	60.4811	56.6825	51.5199	48.1676	43.4489	39.4403	44.5787	46.4061	51.7491	57.7827	60.4920	(72)
Total internal gains	297.6313	295.6637	284.8276	267.6122	250.4214	233.7863	222.9766	228.2514	237.1162	254.5120	274.3842	289.0098	(73)

6. Solar gains

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

East				6.4200	19.6403	0.4500		0.0000	0.7700		43.6904 (76)	

Solar gains	43.6904	85.4676	140.7530	205.2798	251.5781	257.5350	245.1838	210.6093	163.7015	101.4145	54.4767	35.9288 (83)
Total gains	341.3217	381.1313	425.5806	472.8921	501.9995	491.3213	468.1604	438.8607	400.8178	355.9266	328.8609	324.9387 (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	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853		
alpha	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724		
util living area	0.9977	0.9947	0.9834	0.9372	0.8099	0.6132	0.4493	0.4998	0.7709	0.9649	0.9947	0.9983	(86)	
MIT	20.1926	20.3107	20.5144	20.7595	20.9308	20.9901	20.9988	20.9977	20.9615	20.7276	20.4046	20.1559	(87)	
Th 2	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	(88)	
util rest of house	0.9970	0.9931	0.9781	0.9178	0.7627	0.5429	0.3698	0.4159	0.7028	0.9501	0.9928	0.9978	(89)	
MIT 2	19.4719	19.5894	19.7902	20.0232	20.1690	20.2092	20.2133	20.2130	20.1934	19.9981	19.6832	19.4353	(90)	
Living area fraction	19.8290	19.9468	20.1490	20.3881	20.5465	20.5962	20.6025	20.6018	20.5740	20.3595	20.0407	19.7924	(91)	
MIT	19.8290	19.9468	20.1490	20.3881	20.5465	20.5962	20.6025	20.6018	20.5740	20.3595	20.0407	19.7924	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.6790	19.7968	19.9990	20.2381	20.3965	20.4462	20.4525	20.4518	20.4240	20.2095	19.8907	19.6424	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9963	0.9919	0.9763	0.9185	0.7743	0.5641	0.3941	0.4415	0.7221	0.9500	0.9917	0.9973	(94)	
Useful gains	340.0663	378.0576	415.4907	434.3591	388.7184	277.1423	184.4951	193.7691	289.4281	338.1249	326.1374	324.0553	(95)	
Ext temp.	4.3000	4.0000	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	737.5760	714.4494	647.4122	543.7728	417.0830	280.3811	184.7678	194.3258	303.2999	460.8732	613.4388	740.6142	(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	295.7473	226.0553	172.5495	78.7779	21.1032	0.0000	0.0000	0.0000	0.0000	91.3247	206.8570	309.9198	(98)	
Space heating												1402.3348	(98)	
Space heating per m2												24.7369	(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													1549.5412 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	295.7473	226.0553	172.5495	78.7779	21.1032	0.0000	0.0000	0.0000	0.0000	91.3247	206.8570	309.9198	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	326.7926	249.7849	190.6625	87.0474	23.3185	0.0000	0.0000	0.0000	0.0000	100.9113	228.5713	342.4528	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Efficiency of water heater (217)m	89.4320	89.3318	89.0949	88.5738	87.7950	87.3000	87.3000	87.3000	87.3000	88.6595	89.2466	87.3000	(216)
Fuel for water heating, kWh/month	159.7969	140.3473	146.2502	129.7356	126.6995	111.5964	105.0374	118.2152	118.9384	134.5115	143.9650	155.1478	(219)
Water heating fuel used												1590.2410	(219)
Annual totals kWh/year													
Space heating fuel - main system												1549.5412	(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)													30.5419 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													105.5419 (231)
Electricity for lighting (calculated in Appendix L)													291.2184 (232)
Total delivered energy for all uses													3536.5425 (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	1549.5412	0.2160	334.7009	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1590.2410	0.2160	343.4921	(264)
Space and water heating			678.1930	(265)
Pumps and fans	105.5419	0.5190	54.7762	(267)
Energy for lighting	291.2184	0.5190	151.1423	(268)
Total CO2, kg/year			884.1115	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6000	(273)

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

DER			15.6000	ZC1
Total Floor Area		TFA	56.6900	
Assumed number of occupants		N	1.8867	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.1982	ZC2
CO2 emissions from cooking, equation (L16)			2.8979	ZC3
Total CO2 emissions			35.6960	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			35.6960	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	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1470 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3970 (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) =	0.3077 (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												
	0.3923	0.3846	0.3769	0.3384	0.3307	0.2923	0.2923	0.2846	0.3077	0.3307	0.3461	0.3615 (22b)
Effective ac	0.5769	0.5740	0.5710	0.5573	0.5547	0.5427	0.5427	0.5405	0.5473	0.5547	0.5599	0.5653 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200			(26)				
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114			(27)				
WT-E-01	22.5600	6.4200	16.1400	0.1800	2.9052			(29a)				
WT-I-01	26.1600	2.1200	24.0400	0.1800	4.3272			(29a)				
Total net area of external elements Aum(A, m2)			48.7200					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	17.8638		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.4045 (36)				
Total fabric heat loss						(33) + (36) =		22.2683 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 25.9039	Feb 25.7697	Mar 25.6382	Apr 25.0206	May 24.9051	Jun 24.3672	Jul 24.3672	Aug 24.2675	Sep 24.5744	Oct 24.9051	Nov 25.1388	Dec 25.3832 (38)
Heat transfer coeff	48.1721	48.0380	47.9065	47.2889	47.1733	46.6354	46.6354	46.5358	46.8426	47.1733	47.4071	47.6515 (39)
Average = Sum(39)m / 12 =												47.2883 (39)
HLP	Jan 0.8497	Feb 0.8474	Mar 0.8451	Apr 0.8342	May 0.8321	Jun 0.8226	Jul 0.8226	Aug 0.8209	Sep 0.8263	Oct 0.8321	Nov 0.8363	Dec 0.8406 (40)
HLP (average)												0.8342 (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												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
Daily hot water use	Jan 86.9094	Feb 83.7491	Mar 80.5887	Apr 77.4284	May 74.2680	Jun 71.1077	Jul 71.1077	Aug 74.2680	Sep 77.4284	Oct 80.5887	Nov 83.7491	Dec 86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)										Total = Sum(45)m =		1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (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	44.2881	38.5475	41.0671	38.1839	37.8462	35.0668	36.2357	37.8462	38.1839	41.0671	41.3009	44.2881 (61)

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Total heat required for water heating calculated for each month												
	173.1722	151.2704	157.3871	139.5944	135.1520	119.0343	114.0440	127.1323	128.5363	146.3642	156.2409	169.1055 (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 =												
Output from w/h	173.1722	151.2704	157.3871	139.5944	135.1520	119.0343	114.0440	127.1323	128.5363	146.3642	156.2409	169.1055 (64)
Total per year (kWh/year) = Sum (64)m =												1717.0338 (64)
Heat gains from water heating, kWh/month	53.9260	47.1172	48.9432	43.2650	41.8157	36.6859	34.9302	39.1492	39.5882	45.2781	48.5428	52.5738 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	16.4900	14.6463	11.9111	9.0175	6.7407	5.6908	6.1491	7.9928	10.7279	13.6216	15.8984	16.9483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	164.5289	166.2362	161.9339	152.7747	141.2129	130.3465	123.0870	121.3797	125.6821	134.8412	146.4030	157.2694 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334 (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)												
	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671 (71)
Water heating gains (Table 5)												
	72.4812	70.1150	65.7838	60.0902	56.2039	50.9527	46.9492	52.6199	54.9836	60.8576	67.4205	70.6637 (72)
Total internal gains	307.8002	305.2975	293.9290	276.1826	258.4577	241.2901	230.4854	236.2926	245.6937	263.6206	284.0221	299.1816 (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
East	6.4200				19.6403		0.6300		0.7000		0.7700		38.5349 (76)
Solar gains	38.5349	75.3824	124.1441	181.0568	221.8919	227.1458	216.2521	185.7574	144.3847	89.4476	48.0485	31.6892	(83)
Total gains	346.3351	380.6800	418.0731	457.2394	480.3496	468.4359	446.7375	422.0499	390.0785	353.0682	332.0705	330.8708	(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	81.7237	81.9519	82.1768	83.2501	83.4540	84.4166	84.4166	84.5973	84.0432	83.4540	83.0425	82.6166
alpha	6.4482	6.4635	6.4785	6.5500	6.5636	6.6278	6.6278	6.6398	6.6029	6.5636	6.5362	6.5078
util living area	0.9975	0.9948	0.9848	0.9433	0.8253	0.6251	0.4579	0.5044	0.7746	0.9647	0.9943	0.9981 (86)
MIT	20.1956	20.3079	20.5037	20.7524	20.9257	20.9901	20.9989	20.9979	20.9629	20.7362	20.4223	20.1744 (87)
Th 2	20.2104	20.2125	20.2144	20.2238	20.2256	20.2338	20.2338	20.2353	20.2306	20.2256	20.2220	20.2183 (88)
util rest of house												
	0.9967	0.9931	0.9799	0.9255	0.7798	0.5555	0.3789	0.4221	0.7077	0.9499	0.9922	0.9975 (89)
MIT 2	19.1292	19.2944	19.5790	19.9346	20.1545	20.2272	20.2333	20.2344	20.2020	19.9198	19.4691	19.1043 (90)
Living area fraction												
	19.6576	19.7966	20.0372	20.3398	20.5366	20.6052	20.6126	20.6127	20.5790	20.3244	19.9414	19.6345 (92)
MIT	19.6576	19.7966	20.0372	20.3398	20.5366	20.6052	20.6126	20.6127	20.5790	20.3244	19.9414	19.6345 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6576	19.7966	20.0372	20.3398	20.5366	20.6052	20.6126	20.6127	20.5790	20.3244	19.9414	19.6345 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9960	0.9920	0.9785	0.9285	0.7990	0.5897	0.4181	0.4630	0.7394	0.9521	0.9913	0.9970 (94)
Useful gains	344.9505	377.6387	409.0937	424.5258	383.8214	276.2572	186.7909	195.3954	288.4129	336.1459	329.1676	329.8625 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	739.8084	715.6023	648.5196	540.9767	416.8529	280.0557	187.1316	196.0429	303.4947	458.7311	608.7738	735.4776 (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	293.7743	227.1115	178.1328	83.8447	24.5754	0.0000	0.0000	0.0000	0.0000	91.2034	201.3165	301.7776 (98)
Space heating												1401.7363 (98)
Space heating per m2										(98) / (4) =		24.7263 (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)
Fraction of space heat from main system(s)	1.0000 (202)

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Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1500.7883 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	293.7743	227.1115	178.1328	83.8447	24.5754	0.0000	0.0000	0.0000	0.0000	91.2034	201.3165	301.7776 (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)	314.5335	243.1600	190.7204	89.7695	26.3120	0.0000	0.0000	0.0000	0.0000	97.6482	215.5423	323.1024 (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	173.1722	151.2704	157.3871	139.5944	135.1520	119.0343	114.0440	127.1323	128.5363	146.3642	156.2409	169.1055 (64)
Efficiency of water heater	86.3711	86.0720	85.3635	83.8139	81.7045	80.3000	80.3000	80.3000	80.3000	83.8986	85.6904	80.3000 (216)
Fuel for water heating, kWh/month	200.4979	175.7488	184.3728	166.5529	165.4156	148.2370	142.0224	158.3217	160.0702	174.4538	182.3320	195.5133 (219)
Water heating fuel used												2053.5383 (219)
Annual totals kWh/year												
Space heating fuel - main system												1500.7883 (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)												291.2184 (232)
Total delivered energy for all uses												3920.5450 (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	1500.7883	0.2160	324.1703 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2053.5383	0.2160	443.5643 (264)
Space and water heating			767.7346 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	291.2184	0.5190	151.1423 (268)
Total CO2, kg/m2/year			957.8019 (272)
Emissions per m2 for space and water heating			13.5427 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6661 (272b)
Emissions per m2 for pumps and fans			0.6866 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5427 * 1.00) + 2.6661 + 0.6866, rounded to 2 d.p.			16.9000 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1470 (8)
Measured/design AP50					Yes
Infiltration rate					3.9200
Number of sides sheltered					0.3430 (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) =				0.2658 (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	0.3389	0.3323	0.3256	0.2924	0.2858	0.2525	0.2525	0.2459	0.2658	0.2858	0.2991	0.3123 (22b)
	0.5574	0.5552	0.5530	0.5428	0.5408	0.5319	0.5319	0.5302	0.5353	0.5408	0.5447	0.5488 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-T-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Total net area of external elements Aum(A, m ²)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.2288		(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Party Ceilings 1			56.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2819 (36)
Total fabric heat loss						(33) + (36) =	25.5107 (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	25.0280	24.9279	24.8297	24.3687	24.2824	23.8809	23.8809	23.8065	24.0356	24.2824	24.4569	24.6393 (38)
Heat transfer coeff	50.5387	50.4385	50.3404	49.8794	49.7931	49.3916	49.3916	49.3172	49.5462	49.7931	49.9676	50.1500 (39)
Average = Sum(39)m / 12 =												49.8790 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8915	0.8897	0.8880	0.8799	0.8783	0.8713	0.8713	0.8699	0.8740	0.8783	0.8814	0.8846 (40)
HLP (average)												0.8799 (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												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)										Total = Sum(45)m =		1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	27.3879	23.9536	24.7180	21.5497	20.6775	17.8431	16.5343	18.9733	19.1999	22.3756	24.4248	26.5237 (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	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4900	14.6463	11.9111	9.0175	6.7407	5.6908	6.1491	7.9928	10.7279	13.6216	15.8984	16.9483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.5289	166.2362	161.9339	152.7747	141.2129	130.3465	123.0870	121.3797	125.6821	134.8412	146.4030	157.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	36.8117	35.6453	33.2231	29.9302	27.7923	24.7821	22.2235	25.5017	26.6665	30.0748	33.9233	35.6501	(72)
Total internal gains	269.1307	267.8279	258.3682	243.0226	227.0461	212.1195	202.7597	206.1744	214.3767	229.8377	247.5248	261.1680	(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
East				6.4200	19.6403	0.4500	0.0000			0.7700			43.6904 (76)
Solar gains	43.6904	85.4676	140.7530	205.2798	251.5781	257.5350	245.1838	210.6093	163.7015	101.4145	54.4767	35.9288	(83)
Total gains	312.8211	353.2955	399.1212	448.3024	478.6242	469.6545	447.9435	416.7837	378.0782	331.2522	302.0015	297.0968	(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	77.8969	78.0515	78.2037	78.9265	79.0633	79.7060	79.7060	79.8262	79.4572	79.0633	78.7872	78.5006	
alpha	6.1931	6.2034	6.2136	6.2618	6.2709	6.3137	6.3137	6.3217	6.2971	6.2709	6.2525	6.2334	
util living area	0.9987	0.9968	0.9892	0.9548	0.8478	0.6539	0.4825	0.5389	0.8159	0.9772	0.9969	0.9990	(86)
MIT	20.0758	20.2002	20.4170	20.6942	20.9002	20.9843	20.9980	20.9961	20.9418	20.6616	20.3146	20.0500	(87)
Th 2	20.1747	20.1762	20.1777	20.1847	20.1859	20.1920	20.1920	20.1931	20.1897	20.1859	20.1833	20.1806	(88)
util rest of house	0.9982	0.9957	0.9855	0.9395	0.8034	0.5794	0.3954	0.4473	0.7498	0.9667	0.9957	0.9987	(89)
MIT 2	19.3228	19.4480	19.6642	19.9377	20.1197	20.1849	20.1915	20.1920	20.1579	19.9122	19.5684	19.3020	(90)
Living area fraction	19.6959	19.8207	20.0372	20.3126	20.5064	20.5810	20.5911	20.5904	fLA = Living area / (4) =	20.5463	20.2835	19.9381	0.4955 (91)
MIT	19.6959	19.8207	20.0372	20.3126	20.5064	20.5810	20.5911	20.5904	20.5463	20.2835	19.9381	19.6726	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6959	19.8207	20.0372	20.3126	20.5064	20.5810	20.5911	20.5904	20.5463	20.2835	19.9381	19.6726	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9979	0.9951	0.9848	0.9422	0.8220	0.6161	0.4387	0.4929	0.7807	0.9682	0.9952	0.9984	(94)
Ext temp.	312.1577	351.5678	393.0394	422.3818	393.4187	289.3387	196.5046	205.4170	295.1829	320.7187	300.5568	296.6347	(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	778.0898	752.5787	681.4678	569.2521	438.4981	295.4118	197.1258	206.6599	319.3894	482.1729	641.4904	775.9530	(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	346.6535	269.4793	214.5907	105.7466	33.5391	0.0000	0.0000	0.0000	0.0000	120.1220	245.4722	356.6128	(98)
												1692.2162	(98)
												29.8503	(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	464.2808	365.4977	374.8109	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9542	0.9815	0.9721	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	443.0036	358.7420	364.3631	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	620.5112	593.8269	558.7545	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.8054	174.9032	144.6272	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												447.3358	(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	31.9514	43.7258	36.1568	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											111.8339 (107)
Space cooling per m2											1.9727 (108)
Energy for space heating											29.8503 (99)
Energy for space cooling											1.9727 (108)
Total											31.8231 (109)
Dwelling Fabric Energy Efficiency (DFEE)											31.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1470 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3970 (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) = 0.3077 (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												
	0.3923	0.3846	0.3769	0.3384	0.3307	0.2923	0.2923	0.2846	0.3077	0.3307	0.3461	0.3615 (22b)
Effective ac	0.5769	0.5740	0.5710	0.5573	0.5547	0.5427	0.5427	0.5405	0.5473	0.5547	0.5599	0.5653 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114		(27)					
WT-E-01	22.5600	6.4200	16.1400	0.1800	2.9052		(29a)					
WT-I-01	26.1600	2.1200	24.0400	0.1800	4.3272		(29a)					
Total net area of external elements Aum(A, m2)			48.7200				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 17.8638		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.4045 (36)				
Total fabric heat loss								(33) + (36) = 22.2683 (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	25.9039	25.7697	25.6382	25.0206	24.9051	24.3672	24.3672	24.2675	24.5744	24.9051	25.1388	25.3832 (38)
Average = Sum(39)m / 12 =	48.1721	48.0380	47.9065	47.2889	47.1733	46.6354	46.6354	46.5358	46.8426	47.1733	47.4071	47.6515 (39)
												47.2883 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8497	0.8474	0.8451	0.8342	0.8321	0.8226	0.8226	0.8209	0.8263	0.8321	0.8363	0.8406 (40)
Days in month												0.8342 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy content (annual)	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1243.1123 (45)
	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
27.3879 23.9536 24.7180 21.5497 20.6775 17.8431 16.5343 18.9733 19.1999 22.3756 24.4248 26.5237 (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	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338	94.3338 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.4900	14.6463	11.9111	9.0175	6.7407	5.6908	6.1491	7.9928	10.7279	13.6216	15.8984	16.9483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.5289	166.2362	161.9339	152.7747	141.2129	130.3465	123.0870	121.3797	125.6821	134.8412	146.4030	157.2694 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334	32.4334 (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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671 (71)
Water heating gains (Table 5)	36.8117	35.6453	33.2231	29.9302	27.7923	24.7821	22.2235	25.5017	26.6665	30.0748	33.9233	35.6501 (72)
Total internal gains	269.1307	267.8279	258.3682	243.0226	227.0461	212.1195	202.7597	206.1744	214.3767	229.8377	247.5248	261.1680 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Access factor Table 6d	Gains W						
East	6.4200	19.6403	0.6300	0.7000	0.7700	38.5349 (76)						
Solar gains	38.5349	75.3824	124.1441	181.0568	221.8919	227.1458	216.2521	185.7574	144.3847	89.4476	48.0485	31.6892 (83)
Total gains	307.6656	343.2103	382.5124	424.0793	448.9380	439.2653	419.0118	391.9318	358.7614	319.2853	295.5733	292.8572 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.7237	81.9519	82.1768	83.2501	83.4540	84.4166	84.4166	84.5973	84.0432	83.4540	83.0425	82.6166
alpha	6.4482	6.4635	6.4785	6.5500	6.5636	6.6278	6.6278	6.6398	6.6029	6.5636	6.5362	6.5078
util living area	0.9987	0.9971	0.9905	0.9594	0.8576	0.6617	0.4875	0.5417	0.8191	0.9783	0.9971	0.9991 (86)
MIT	20.1287	20.2440	20.4461	20.7094	20.9055	20.9863	20.9984	20.9969	20.9483	20.6866	20.3600	20.1082 (87)
Th 2	20.2104	20.2125	20.2144	20.2238	20.2256	20.2338	20.2338	20.2353	20.2306	20.2256	20.2220	20.2183 (88)
util rest of house	0.9983	0.9961	0.9872	0.9455	0.8156	0.5900	0.4038	0.4540	0.7554	0.9684	0.9959	0.9988 (89)
MIT 2	19.4055	19.5222	19.7244	19.9873	20.1622	20.2275	20.2333	20.2343	20.2022	19.9708	19.6462	19.3918 (90)
Living area fraction	19.7638	19.8798	20.0820	20.3451	20.5305	20.6035	20.6124	20.6122	20.5719	20.3255	19.9999	19.7468 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7638	19.8798	20.0820	20.3451	20.5305	20.6035	20.6124	20.6122	20.5719	20.3255	19.9999	19.7468 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9980	0.9956	0.9866	0.9479	0.8332	0.6253	0.4454	0.4976	0.7854	0.9699	0.9955	0.9986 (94)
Useful gains	307.0617	341.7049	377.3688	402.0031	374.0446	274.6727	186.6237	195.0281	281.7560	309.6741	294.2495	292.4350 (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	744.9264	719.6010	650.6658	541.2265	416.5659	279.9735	187.1199	196.0174	303.1598	458.7829	611.5466	740.8275 (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	325.7714	253.9461	203.3330	100.2409	31.6358	0.0000	0.0000	0.0000	0.0000	110.9370	228.4539	333.6040 (98)
Space heating												1587.9221 (98)
Space heating per m ²												28.0106 (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	438.3729	345.1021	353.6721	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9584	0.9841	0.9762	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	420.1196	339.6133	345.2463	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	584.9914	560.0106	529.7068	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	118.7077	163.9756	137.2386	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												419.9219 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												

fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	29.6769	40.9939	34.3097	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												104.9805 (107)
Space cooling per m2												1.8518 (108)
Energy for space heating												28.0106 (99)
Energy for space cooling												1.8518 (108)
Total												29.8625 (109)
Target Fabric Energy Efficiency (TFEE)												34.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (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					3.9200
Infiltration rate					0.1960 (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) =				0.1519 (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	0.1595	0.1519	0.1519	0.1405	0.1405	0.1253	0.1291	0.1215	0.1253	0.1329	0.1329	0.1443 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Total net area of external elements Aum(A, m2)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.2288		(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Party Ceilings 1			56.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2819 (36)
Total fabric heat loss						(33) + (36) =	25.5107 (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	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492 (38)
Average = Sum(39)m / 12 =	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460 (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												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)												Total = Sum(45)m = 1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (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	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169	(61)
Total heat required for water heating calculated for each month	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2250	36.6157	29.7779	22.5438	16.8517	14.2269	15.3727	19.9820	26.8198	34.0539	39.7460	42.3707	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.5655	248.1137	241.6923	228.0220	210.7656	194.5470	183.7120	181.1638	187.5852	201.2556	218.5119	234.7305	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	62.3123	60.4811	56.6825	51.5199	48.1676	43.4489	39.4403	44.5787	46.4061	51.7491	57.7827	60.4920	(72)
Total internal gains	438.0430	434.1508	417.0929	391.0259	364.7251	341.1631	327.4653	334.6648	349.7513	375.9989	404.9808	426.5335	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	g	Specific data	FF	Access	Gains						
	m2	Table 6a	W/m2	or Table 6b	or Table 6c	factor	W						
						Table 6d							
East	6.4200	22.3313	0.4500		0.0000	0.7700	49.6767	(76)					
Solar gains	49.6767	87.4133	141.9438	212.7330	253.4804	277.4807	261.3980	229.9683	178.7458	110.6885	63.4559	40.4553	(83)
Total gains	487.7197	521.5641	559.0367	603.7589	618.2055	618.6438	588.8633	564.6330	528.4972	486.6874	468.4367	466.9888	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	
alpha	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	
util living area	0.9793	0.9666	0.9230	0.8060	0.6096	0.3871	0.2525	0.2718	0.5224	0.8308	0.9557	0.9834	0.9834	(86)
MIT	20.5003	20.5889	20.7610	20.9198	20.9880	20.9994	21.0000	21.0000	20.9963	20.9185	20.6917	20.4680	20.4680	(87)
Th 2	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	(88)
util rest of house	0.9734	0.9575	0.9035	0.7667	0.5538	0.3265	0.1884	0.2050	0.4535	0.7859	0.9419	0.9785	0.9785	(89)
MIT 2	19.7751	19.8603	20.0217	20.1579	20.2073	20.2135	20.2136	20.2136	20.2122	20.1600	19.9602	19.7438	19.7438	(90)
Living area fraction	20.1344	20.2213	20.3880	20.5354	20.5942	20.6029	20.6033	20.6033	20.6008	20.5358	20.3226	20.1027	20.1027	(91)
MIT	19.9844	20.0713	20.2380	20.3854	20.4442	20.4529	20.4533	20.4533	20.4508	20.3858	20.1726	19.9527	19.9527	(92)
Temperature adjustment														
adjusted MIT														

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9714	0.9556	0.9041	0.7757	0.5704	0.3450	0.2079	0.2254	0.4744	0.7964	0.9411	0.9766	(94)	
Useful gains	473.7845	498.4310	505.4499	468.3342	352.6309	213.4185	122.4508	127.2437	250.7346	387.6196	440.8475	456.0632	(95)	
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)	
Heat loss rate W	713.8551	694.0436	615.7106	502.8807	357.0211	213.5617	122.4546	127.2501	251.8260	421.3671	583.7988	712.3324	(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	178.6125	131.4517	82.0339	24.8734	3.2663	0.0000	0.0000	0.0000	0.0000	25.1082	102.9250	190.6643	(98)	
Space heating														
RHI space heating demand														

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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	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.9200					
Infiltration rate							0.1960	(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) =	0.1519 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
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												
	0.1937	0.1899	0.1861	0.1671	0.1633	0.1443	0.1443	0.1405	0.1519	0.1633	0.1709	0.1785 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1			2.1200	1.0000	2.1200		(26)					
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)					
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)					
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)					
Total net area of external elements Aum(A, m2)			48.7200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		20.2288		(33)					
Party Wall 1			26.4000	0.0000	0.0000		(32)					
Party Floor 1			56.6900				(32d)					
Party Ceilings 1			56.6900				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2819 (36)					
Total fabric heat loss						(33) + (36) =	25.5107 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.4492	Feb 22.4492	Mar 22.4492	Apr 22.4492	May 22.4492	Jun 22.4492	Jul 22.4492	Aug 22.4492	Sep 22.4492	Oct 22.4492	Nov 22.4492	Dec 22.4492 (38)
Heat transfer coeff	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599 (39)
Average = Sum(39)m / 12 =												47.9599 (39)
HLP	Jan 0.8460	Feb 0.8460	Mar 0.8460	Apr 0.8460	May 0.8460	Jun 0.8460	Jul 0.8460	Aug 0.8460	Sep 0.8460	Oct 0.8460	Nov 0.8460	Dec 0.8460 (40)
HLP (average)												0.8460 (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													1.8867 (42)
Average daily hot water use (litres/day)													79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)	
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)	
Energy content (annual)												Total = Sum(45)m = 1243.1123 (45)	
Distribution loss (46)m = 0.15 x (45)m	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (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	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169	(61)
Total heat required for water heating calculated for each month	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Heat gains from water heating, kWh/month	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	113.2006	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.2250	36.6157	29.7779	22.5438	16.8517	14.2269	15.3727	19.9820	26.8198	34.0539	39.7460	42.3707	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.5655	248.1137	241.6923	228.0220	210.7656	194.5470	183.7120	181.1638	187.5852	201.2556	218.5119	234.7305	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	48.2067	(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)	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	-75.4671	(71)
Water heating gains (Table 5)	62.3123	60.4811	56.6825	51.5199	48.1676	43.4489	39.4403	44.5787	46.4061	51.7491	57.7827	60.4920	(72)
Total internal gains	438.0430	434.1508	417.0929	391.0259	364.7251	341.1631	327.4653	334.6648	349.7513	375.9989	404.9808	426.5335	(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		
-----	-----														
East					6.4200	19.6403		0.4500	0.0000		0.7700		43.6904 (76)		

Solar gains	43.6904	85.4676	140.7530	205.2798	251.5781	257.5350	245.1838	210.6093	163.7015	101.4145	54.4767	35.9288	(83)		
Total gains	481.7334	519.6184	557.8459	596.3057	616.3033	598.6981	572.6491	545.2740	513.4529	477.4134	459.4576	462.4623	(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	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853	82.0853		
alpha	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724	6.4724		
util living area	0.9848	0.9734	0.9412	0.8541	0.6966	0.5094	0.3681	0.4039	0.6306	0.8844	0.9702	0.9881	(86)	
MIT	20.4274	20.5329	20.7012	20.8755	20.9707	20.9965	20.9996	20.9993	20.9875	20.8657	20.6126	20.3883	(87)	
Th 2	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	20.2136	(88)	
util rest of house	0.9806	0.9663	0.9261	0.8220	0.6462	0.4483	0.3026	0.3352	0.5644	0.8506	0.9609	0.9847	(89)	
MIT 2	19.7036	19.8062	19.9662	20.1217	20.1960	20.2122	20.2135	20.2135	20.2077	20.1172	19.8850	19.6654	(90)	
Living area fraction														
MIT	20.0622	20.1663	20.3304	20.4952	20.5799	20.6008	20.6031	20.6029	20.5941	20.4881	20.2455	20.0236	(92)	
Temperature adjustment														
adjusted MIT	19.9122	20.0163	20.1804	20.3452	20.4299	20.4508	20.4531	20.4529	20.4441	20.3381	20.0955	19.8736	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9787	0.9642	0.9254	0.8278	0.6605	0.4668	0.3226	0.3562	0.5842	0.8565	0.9593	0.9830	(94)
Useful gains	471.4598	501.0249	516.2335	493.5930	407.0427	279.4955	184.7094	194.2173	299.9843	408.8902	440.7625	454.5831	(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	748.7617	724.9755	656.1109	548.9107	418.6846	280.6042	184.7922	194.3751	304.2621	467.0386	623.2646	751.7053	(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	206.3126	150.4947	104.0688	39.8287	8.6616	0.0000	0.0000	0.0000	0.0000	43.2624	131.4015	221.0590	(98)
Space heating													
Space heating per m ²													

8c. Space cooling requirement

Not applicable

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1000.0986	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	206.3126	150.4947	104.0688	39.8287	8.6616	0.0000	0.0000	0.0000	0.0000	43.2624	131.4015	221.0590	(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)	227.9697	166.2925	114.9932	44.0097	9.5708	0.0000	0.0000	0.0000	0.0000	47.8037	145.1950	244.2640	(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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343	(64)
Efficiency of water heater	89.1625	89.0171	88.6925	88.1018	87.5236	87.3000	87.3000	87.3000	87.3000	88.1295	88.8892	87.3000	(216)
(217)m	89.1625	89.0171	88.6925	88.1018	87.5236	87.3000	87.3000	87.3000	87.3000	88.1295	88.8892	89.2381	(217)
Fuel for water heating, kWh/month	160.2798	140.8435	146.9137	130.4307	127.0924	111.5964	105.0374	118.2152	118.9384	135.3205	144.5439	155.5773	(219)
Water heating fuel used												1594.7890	(219)
Annual totals kWh/year													
Space heating fuel - main system												1000.0986	(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)												30.5419	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												105.5419	(231)
Electricity for lighting (calculated in Appendix L)												291.2184	(232)
Total delivered energy for all uses												2991.6479	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1000.0986	3.4800	34.8034 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1594.7890	3.4800	55.4987 (247)
Mechanical ventilation fans	30.5419	13.1900	4.0285 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	291.2184	13.1900	38.4117 (250)
Additional standing charges			120.0000 (251)
Total energy cost			262.6348 (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] = 1.0847 (257)
SAP value	84.8680
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	1000.0986	0.2160	216.0213 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1594.7890	0.2160	344.4744 (264)
Space and water heating			560.4957 (265)
Pumps and fans	105.5419	0.5190	54.7762 (267)
Energy for lighting	291.2184	0.5190	151.1423 (268)
Total kg/year			766.4143 (272)
CO2 emissions per m2			13.5200 (273)
EI value			89.9007
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	$3.48 / 0.8816 = 3.947$, stars = 4
Water heating environmental impact	$0.216 / 0.8816 = 0.2450$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.6900 (1b)	x 2.4000 (2b)	= 136.0560 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.6900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.0560 (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					3.9200
Infiltration rate					0.1960 (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) =				0.1519 (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	0.1595	0.1519	0.1519	0.1405	0.1405	0.1253	0.1291	0.1215	0.1253	0.1329	0.1329	0.1443 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-01	22.5600	6.4200	16.1400	0.2000	3.2280		(29a)
WT-I-01	26.1600	2.1200	24.0400	0.2890	6.9474		(29a)
Total net area of external elements Aum(A, m2)			48.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.2288		(33)
Party Wall 1			26.4000	0.0000	0.0000		(32)
Party Floor 1			56.6900				(32d)
Party Ceilings 1			56.6900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2819 (36)
Total fabric heat loss						(33) + (36) =	25.5107 (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	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492	22.4492 (38)
Average = Sum(39)m / 12 =	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599	47.9599 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460	0.8460 (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												1.8867 (42)
Average daily hot water use (litres/day)												79.0086 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.9094	83.7491	80.5887	77.4284	74.2680	71.1077	71.1077	74.2680	77.4284	80.5887	83.7491	86.9094 (44)
Energy conte	128.8842	112.7229	116.3199	101.4105	97.3058	83.9675	77.8083	89.2861	90.3525	105.2971	114.9400	124.8174 (45)
Energy content (annual)												Total = Sum(45)m = 1243.1123 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.3326	16.9084	17.4480	15.2116	14.5959	12.5951	11.6712	13.3929	13.5529	15.7946	17.2410	18.7226 (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	14.0254	12.6519	13.9815	13.5012	13.9300	13.4561	13.8893	13.9157	13.4807	13.9602	13.5438	14.0169 (61)
Total heat required for water heating calculated for each month												
	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343 (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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343 (64)
								Total per year (kWh/year) = Sum(64)m =				1407.4652 (64)
Heat gains from water heating, kWh/month												
	46.3603	40.6433	42.1718	37.0943	35.8367	31.2832	29.3436	33.1666	33.4124	38.5013	41.6035	45.0060 (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												816.5031 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	178.6125	131.4517	82.0339	24.8734	3.2663	0.0000	0.0000	0.0000	0.0000	25.1082	102.9250	190.6643 (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)	197.3619	145.2505	90.6452	27.4845	3.6092	0.0000	0.0000	0.0000	0.0000	27.7438	113.7293	210.6788 (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	142.9095	125.3748	130.3015	114.9118	111.2358	97.4236	91.6976	103.2018	103.8332	119.2573	128.4839	138.8343 (64)
Efficiency of water heater (217)m	89.0492	88.9091	88.5091	87.8528	87.3881	87.3000	87.3000	87.3000	87.3000	87.8402	88.6949	87.3000 (216)
Fuel for water heating, kWh/month	160.4839	141.0146	147.2182	130.8004	127.2894	111.5964	105.0374	118.2152	118.9384	135.7662	144.8605	155.7774 (219)
Water heating fuel used												1596.9979 (219)
Annual totals kWh/year												
Space heating fuel - main system												816.5031 (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)												30.5419 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												105.5419 (231)
Electricity for lighting (calculated in Appendix L)												291.2184 (232)
Total delivered energy for all uses												2810.2612 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	816.5031	3.6300	29.6391 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1596.9979	3.6300	57.9710 (247)
Mechanical ventilation fans	30.5419	19.4400	5.9373 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	291.2184	19.4400	56.6129 (250)
Additional standing charges			95.0000 (251)
Total energy cost			259.7403 (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	816.5031	0.2160	176.3647 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1596.9979	0.2160	344.9515 (264)
Space and water heating			521.3162 (265)
Pumps and fans	105.5419	0.5190	54.7762 (267)
Energy for lighting	291.2184	0.5190	151.1423 (268)
Total kg/year			727.2348 (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	816.5031	1.2200	996.1338 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1596.9979	1.2200	1948.3374 (264)
Space and water heating			2944.4712 (265)
Pumps and fans	105.5419	3.0700	324.0135 (267)
Energy for lighting	291.2184	3.0700	894.0404 (268)
Primary energy kWh/year			4162.5251 (272)
Primary energy kWh/m2/year			73.4261 (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 488 TEST (12 Jan 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£77	£77	£0
Mains gas	£183	£183	£0
Space heating	£145	£145	£0
Water heating	£58	£58	£0
Lighting	£57	£57	£0
Total cost of fuels	£260	£260	£0
Total cost of uses	£260	£260	£0
Delivered energy	50 kWh/m²	50 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	73 kWh/m²	73 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	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	269.39 (P1)
Transmission heat loss coefficient	25.51 (37)
Summer heat loss coefficient	294.90 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
East	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
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
East	6.4200	117.5071	0.4500 0.0000
total:			0.9000 305.5301

	Jun	Jul	Aug	
Solar gains	324	306	269	(P4)
Internal gains	338	324	332	
Total summer gains	662	630	600	(P5)
Summer gain/loss ratio	2.25	2.14	2.04	(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	18.50	20.29	20.09	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			