

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026e_138_As_Built				Issued on Date	01/03/2022
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	83 B	DER	18.48	TER	19.13	
Environmental	87 B	% DER<TER	3.38			
CO ₂ Emissions (t/year)	1.07	DFEE	46.56	TFEE	50.30	
General Requirements Compliance	Pass	% DFEE<TFEE	7.45			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Top-floor flat, total floor area 71 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.13 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.48 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 46.6 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.33 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
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: 3.35 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

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

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing West: 6.68 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.4 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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.3500
Infiltration rate					0.1675 (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) =				0.1298 (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	0.1655	0.1623	0.1590	0.1428	0.1395	0.1233	0.1233	0.1201	0.1298	0.1395	0.1460	0.1525 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Flat	70.9600		70.9600	0.1500	10.6440		(30)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	33.2514	(33)
Party Wall 1					24.8600	0.0000	(32)
Party Floor 1					70.9600		(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4942 (36)
Total fabric heat loss							(33) + (36) = 47.7456 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Heat transfer coeff	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457 (39)
Average = Sum(39)m / 12 =												75.8457 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689 (40)
HLP (average)												1.0689 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

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CALCULATION OF 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	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	349.3220	347.0245	334.1205	313.6057	292.9740	273.2094	260.5136	266.4991	277.2046	297.9206	321.5424	339.0664	(73)

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
West					6.6800	19.6403		0.4500	0.0000	0.7700		45.4597 (80)
Solar gains	45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839 (83)
Total gains	394.7818	435.9534	480.5737	527.1990	554.7406	541.1742	515.6270	485.6377	447.5358	403.4423	378.2254	376.4503 (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	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711		
alpha	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314		
util living area	0.9986	0.9973	0.9931	0.9772	0.9241	0.7930	0.6232	0.6788	0.9000	0.9861	0.9973	0.9989	(86)	
MIT	19.8281	19.9437	20.1638	20.4592	20.7411	20.9244	20.9834	20.9742	20.8380	20.4748	20.0905	19.7935	(87)	
Th 2	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	(88)	
util rest of house	0.9982	0.9964	0.9906	0.9678	0.8912	0.7091	0.4974	0.5542	0.8439	0.9788	0.9962	0.9986	(89)	
MIT 2	18.9534	19.0687	19.2877	19.5781	19.8421	19.9890	20.0218	20.0184	19.9299	19.5964	19.2155	18.9188	(90)	
Living area fraction	19.2665	19.3819	19.6013	19.8935	20.1639	20.3238	20.3660	20.3605	20.2549	19.9108	19.5287	19.2319	(92)	
MIT	19.1165	19.2319	19.4513	19.7435	20.0139	20.1738	20.2160	20.2105	20.1049	19.7608	19.3787	19.0819	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9975	0.9954	0.9886	0.9643	0.8907	0.7232	0.5231	0.5794	0.8493	0.9761	0.9951	0.9981	(94)
Useful gains	393.8116	433.9457	475.0860	508.3963	494.1081	391.3876	269.7418	281.3714	380.1112	393.8079	376.3781	375.7301	(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	1123.7662	1087.0137	982.2997	822.4335	630.5746	422.7499	274.2585	289.0119	455.4494	694.8094	931.2841	1128.7282	(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	543.0862	438.8617	377.3669	226.1068	101.5310	0.0000	0.0000	0.0000	0.0000	223.9451	399.5323	560.2306	(98)
Space heating												2870.6608	(98)
Space heating per m2												40.4546	(99)
										(98) / (4) =			

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												3172.0009 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	543.0862	438.8617	377.3669	226.1068	101.5310	0.0000	0.0000	0.0000	0.0000	223.9451	399.5323	560.2306 (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)	600.0953	484.9300	416.9800	249.8418	112.1890	0.0000	0.0000	0.0000	0.0000	247.4532	441.4722	619.0393 (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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501 (64)
Efficiency of water heater	89.7593	89.7116	89.5942	89.3246	88.7220	87.3000	87.3000	87.3000	87.3000	89.2896	89.6395	87.3000 (216)
(217)m	89.7593	89.7116	89.5942	89.3246	88.7220	87.3000	87.3000	87.3000	87.3000	89.2896	89.6395	89.7930 (217)
Fuel for water heating, kWh/month	175.7981	154.2628	160.4252	141.7510	138.0346	122.6961	115.3229	130.0199	130.8860	147.1780	158.1409	170.6704 (219)
Water heating fuel used												1745.1860 (219)
Annual totals kWh/year												
Space heating fuel - main system												3172.0009 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)												
mechanical ventilation fans (SFP = 0.1840)												38.2298 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												113.2298 (231)
Electricity for lighting (calculated in Appendix L)												367.3218 (232)
Total delivered energy for all uses												5397.7385 (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	3172.0009	0.2160	685.1522 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1745.1860	0.2160	376.9602 (264)
Space and water heating			1062.1124 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total CO2, kg/year			1311.5186 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4800 (273)

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

DER		18.4800 ZC1
Total Floor Area	TFA	70.9600
Assumed number of occupants	N	2.2692
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6623 ZC2
CO2 emissions from cooking, equation (L16)		2.4445 ZC3
Total CO2 emissions		37.5868 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		37.5868 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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1762 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4262 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3303 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4211	0.4128	0.4046	0.3633	0.3550	0.3138	0.3138	0.3055	0.3303	0.3550	0.3716	0.3881 (22b)
Effective ac	0.5887	0.5852	0.5818	0.5660	0.5630	0.5492	0.5492	0.5467	0.5545	0.5630	0.5690	0.5753 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.6800	1.3258	8.8561		(27)
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876		(29a)
Flat	70.9600		70.9600	0.1300	9.2248		(30)
Total net area of external elements Aum, m ²			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.4233	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5823 (36)
Total fabric heat loss						(33) + (36) =	42.0056 (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	33.0829	32.8894	32.6998	31.8090	31.6423	30.8664	30.8664	30.7228	31.1653	31.6423	31.9795	32.3320 (38)
Heat transfer coeff	75.0885	74.8950	74.7053	73.8145	73.6479	72.8720	72.8720	72.7283	73.1708	73.6479	73.9850	74.3375 (39)
Average = Sum(39)m / 12 =												73.8137 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0582	1.0555	1.0528	1.0402	1.0379	1.0269	1.0269	1.0249	1.0312	1.0379	1.0426	1.0476 (40)
HLP (average)												1.0402 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	49.3807	42.9800	45.7894	42.5745	42.1980	39.0991	40.4024	42.1980	42.5745	45.7894	46.0500	49.3807 (61)
Total heat required for water heating calculated for each month	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506 (64)
Heat gains from water heating, kWh/month	60.1268	52.5352	54.5710	48.2399	46.6240	40.9043	38.9467	43.6509	44.1403	50.4845	54.1246	58.6192 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682 (71)
Water heating gains (Table 5)	80.8157	78.1773	73.3482	66.9999	62.6667	56.8116	52.3477	58.6705	61.3060	67.8555	75.1731	78.7892 (72)
Total internal gains	361.1802	358.2868	344.7902	323.6846	302.4585	282.1011	269.4117	275.9896	287.2924	308.5992	332.8098	350.9281 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
West					6.6800	19.6403	0.6300	0.7000			0.7700	40.0955 (80)
Solar gains	40.0955	78.4353	129.1718	188.3893	230.8782	236.3449	225.0100	193.2802	150.2321	93.0701	49.9944	32.9726 (83)
Total gains	401.2757	436.7221	473.9620	512.0740	533.3367	518.4460	494.4217	469.2698	437.5245	401.6693	382.8042	383.9007 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.6263	65.7958	65.9629	66.7589	66.9100	67.6224	67.6224	67.7560	67.3462	66.9100	66.6051	66.2892
alpha	5.3751	5.3864	5.3975	5.4506	5.4607	5.5082	5.5082	5.5171	5.4897	5.4607	5.4403	5.4193
util living area	0.9985	0.9973	0.9935	0.9788	0.9295	0.7983	0.6262	0.6774	0.8996	0.9858	0.9971	0.9988 (86)
MIT	19.8514	19.9627	20.1749	20.4707	20.7444	20.9289	20.9851	20.9774	20.8494	20.5001	20.1270	19.8328 (87)
Th 2	20.0351	20.0374	20.0396	20.0499	20.0519	20.0609	20.0609	20.0626	20.0575	20.0519	20.0480	20.0439 (88)
util rest of house	0.9980	0.9964	0.9910	0.9702	0.8987	0.7170	0.5039	0.5566	0.8443	0.9784	0.9959	0.9984 (89)
MIT 2	18.4953	18.6595	18.9705	19.4046	19.7832	20.0089	20.0549	20.0523	19.9257	19.4520	18.9077	18.4745 (90)
Living area fraction									fLA = Living area / (4) =			0.3579 (91)
MIT	18.9808	19.1260	19.4016	19.7862	20.1272	20.3382	20.3878	20.3834	20.2564	19.8272	19.3442	18.9607 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9808	19.1260	19.4016	19.7862	20.1272	20.3382	20.3878	20.3834	20.2564	19.8272	19.3442	18.9607 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	400.1573	434.6023	468.6815	495.2186	480.8390	385.2919	270.9956	281.6129	375.3812	392.0466	380.7579	383.0574 (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	1102.3553	1065.4538	963.8183	803.5628	620.6478	418.1555	276.0261	289.7094	450.4656	679.5631	905.8842	1097.2749 (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	522.4353	423.9322	368.3818	222.0078	104.0177	0.0000	0.0000	0.0000	0.0000	213.9122	378.0910	531.3779 (98)
Space heating												2764.1560 (98)
Space heating per m ²										(98) / (4) =		38.9537 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2959.4818 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	522.4353	423.9322	368.3818	222.0078	104.0177	0.0000	0.0000	0.0000	0.0000	213.9122	378.0910	531.3779	(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)	559.3526	453.8889	394.4131	237.6958	111.3680	0.0000	0.0000	0.0000	0.0000	229.0281	404.8083	568.9271	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.0850	168.6647	175.4847	155.6461	150.6929	132.7219	127.1577	141.7510	143.3165	163.1944	174.2068	188.5506	(64)
Efficiency of water heater	87.4324	87.2756	86.8743	85.9448	84.1389	80.3000	80.3000	80.3000	80.3000	85.7334	86.9504	87.5171	(217)
Fuel for water heating, kWh/month	220.8391	193.2552	201.9984	181.1001	179.1001	165.2825	158.3532	176.5268	178.4763	190.3509	200.3519	215.4444	(219)
Water heating fuel used												2261.0790	(219)
Annual totals kWh/year													
Space heating fuel - main system												2959.4818	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												367.3218	(232)
Total delivered energy for all uses												5662.8825	(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	2959.4818	0.2160	639.2481 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2261.0790	0.2160	488.3931 (264)
Space and water heating			1127.6411 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total CO2, kg/m2/year			1357.2061 (272)
Emissions per m2 for space and water heating			15.8912 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6866 (272b)
Emissions per m2 for pumps and fans			0.5485 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8912 * 1.00) + 2.6866 + 0.5485, rounded to 2 d.p.			19.1300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					3.3500
Number of sides sheltered					0.3437 (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) =				0.2663 (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	0.3396	0.3329	0.3263	0.2930	0.2863	0.2530	0.2530	0.2464	0.2663	0.2863	0.2996	0.3129 (22b)
Effective ac	0.5577	0.5554	0.5532	0.5429	0.5410	0.5320	0.5320	0.5303	0.5355	0.5410	0.5449	0.5490 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Flat	70.9600		70.9600	0.1500	10.6440		(30)
Total net area of external elements Aum, m ²			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.2514		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Floor 1			70.9600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4942 (36)
Total fabric heat loss						(33) + (36) =	47.7456 (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	31.3404	31.2146	31.0913	30.5120	30.4036	29.8991	29.8991	29.8056	30.0934	30.4036	30.6229	30.8521 (38)
Heat transfer coeff	79.0860	78.9602	78.8368	78.2575	78.1492	77.6446	77.6446	77.5512	77.8390	78.1492	78.3684	78.5976 (39)
Average = Sum(39)m / 12 =												78.2570 (39)
HLP	1.1145	1.1127	1.1110	1.1028	1.1013	1.0942	1.0942	1.0929	1.0969	1.1013	1.1044	1.1076 (40)
HLP (average)												1.1028 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy content (annual)	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Distribution loss (46)m = 0.15 x (45)m												1386.0553 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.5372	26.7080	27.5603	24.0277	23.0552	19.8948	18.4355	21.1550	21.4077	24.9486	27.2333	29.5736 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	41.0446	39.7440	37.0434	33.3718	30.9881	27.6317	24.7789	28.4341	29.7329	33.5330	37.8240	39.7495	(72)
Total internal gains	318.4091	316.8535	305.4854	287.0566	267.7799	249.9213	238.8429	242.7532	252.7193	271.2767	292.4608	308.8884	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
-----				-----				-----					
West				6.6800	19.6403		0.4500	0.0000	0.7700		45.4597 (80)		
-----				-----				-----					
Solar gains		45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839 (83)
Total gains		363.8688	405.7824	451.9387	500.6499	529.5465	517.8860	493.9562	461.8918	423.0505	376.7984	349.1437	346.2723 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.3091	62.4084	62.5060	62.9687	63.0560	63.4658	63.4658	63.5423	63.3073	63.0560	62.8796	62.6963	
alpha	5.1539	5.1606	5.1671	5.1979	5.2037	5.2311	5.2311	5.2362	5.2205	5.2037	5.1920	5.1798	
util living area	0.9991	0.9981	0.9950	0.9825	0.9392	0.8217	0.6572	0.7155	0.9210	0.9901	0.9982	0.9993	(86)
MIT	19.7249	19.8457	20.0756	20.3925	20.6936	20.9045	20.9772	20.9649	20.8029	20.4129	20.0113	19.7003	(87)
Th 2	19.9890	19.9904	19.9919	19.9985	19.9998	20.0056	20.0056	20.0066	20.0033	19.9998	19.9972	19.9946	(88)
util rest of house	0.9987	0.9975	0.9931	0.9750	0.9107	0.7404	0.5257	0.5875	0.8718	0.9847	0.9974	0.9990	(89)
MIT 2	18.8202	18.9420	19.1723	19.4907	19.7776	19.9570	19.9992	19.9955	19.8821	19.5143	19.1131	18.8002	(90)
Living area fraction	19.1441	19.2655	19.4956	19.8135	20.1055	20.2962	20.3493	20.3425	20.2117	19.8359	19.4346	19.1224	(91)
MIT	19.1441	19.2655	19.4956	19.8135	20.1055	20.2962	20.3493	20.3425	20.2117	19.8359	19.4346	19.1224	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1441	19.2655	19.4956	19.8135	20.1055	20.2962	20.3493	20.3425	20.2117	19.8359	19.4346	19.1224	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9968	0.9918	0.9733	0.9143	0.7668	0.5735	0.6340	0.8842	0.9835	0.9968	0.9987	(94)
Ext temp.	363.2686	404.4854	448.2354	487.2596	484.1812	397.0973	283.2998	292.8442	374.0533	370.5714	348.0140	345.8324	(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	1173.9565	1134.3003	1024.5343	854.0641	656.8847	442.2793	291.1115	305.7448	475.7317	721.7798	966.6420	1172.8659	(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	603.1518	490.4356	428.7664	264.0992	128.4914	0.0000	0.0000	0.0000	0.0000	261.2990	445.4121	615.3129	(98)
Space heating per m2												3236.9685	(98)
												45.6168	(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	729.8595	574.5703	589.3891	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8157	0.8923	0.8637	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	595.3330	512.7084	509.0406	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	690.9813	661.4127	625.7432	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	68.8667	110.6360	86.8267	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												266.3295	(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	17.2167	27.6590	21.7067	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											66.5824 (107)
Space cooling per m2											0.9383 (108)
Energy for space heating											45.6168 (99)
Energy for space cooling											0.9383 (108)
Total											46.5551 (109)
Dwelling Fabric Energy Efficiency (DFEE)											46.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	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					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1762 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4262 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3303 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4211	0.4128	0.4046	0.3633	0.3550	0.3138	0.3138	0.3055	0.3303	0.3550	0.3716	0.3881 (22b)
Effective ac	0.5887	0.5852	0.5818	0.5660	0.5630	0.5492	0.5492	0.5467	0.5545	0.5630	0.5690	0.5753 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.6800	1.3258	8.8561		(27)
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876		(29a)
Flat	70.9600		70.9600	0.1300	9.2248		(30)
Total net area of external elements Aum, m ²			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 28.4233		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5823 (36)
Total fabric heat loss						(33) + (36) =	42.0056 (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	33.0829	32.8894	32.6998	31.8090	31.6423	30.8664	30.8664	30.7228	31.1653	31.6423	31.9795	32.3320 (38)
Heat transfer coeff	75.0885	74.8950	74.7053	73.8145	73.6479	72.8720	72.8720	72.7283	73.1708	73.6479	73.9850	74.3375 (39)
Average = Sum(39)m / 12 =												73.8137 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0582	1.0555	1.0528	1.0402	1.0379	1.0269	1.0269	1.0249	1.0312	1.0379	1.0426	1.0476 (40)
HLP (average)												1.0402 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2692 (42)
Average daily hot water use (litres/day)												88.0936 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	30.5372	26.7080	27.5603	24.0277	23.0552	19.8948	18.4355	21.1550	21.4077	24.9486	27.2333	29.5736 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	113.4602	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.7993	18.4737	15.0239	11.3740	8.5022	7.1779	7.7560	10.0815	13.5314	17.1813	20.0531	21.3774 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5272	201.5977	196.3801	185.2727	171.2515	158.0736	149.2699	147.1994	152.4169	163.5244	177.5456	190.7235 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	34.3460	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	41.0446	39.7440	37.0434	33.3718	30.9881	27.6317	24.7789	28.4341	29.7329	33.5330	37.8240	39.7495 (72)
Total internal gains	318.4091	316.8535	305.4854	287.0566	267.7799	249.9213	238.8429	242.7532	252.7193	271.2767	292.4608	308.8884 (73)

6. Solar gains

[Jan]												
Area	6.6800											
Solar flux	19.6403											
Specific data	0.6300											
FF	0.7000											
Access factor	0.7700											
Gains W	40.0955											(80)
Solar gains	40.0955	78.4353	129.1718	188.3893	230.8782	236.3449	225.0100	193.2802	150.2321	93.0701	49.9944	32.9726 (83)
Total gains	358.5046	395.2888	434.6572	475.4459	498.6581	486.2662	463.8528	436.0334	402.9514	364.3468	342.4551	341.8610 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	65.6263	65.7958	65.9629	66.7589	66.9100	67.6224	67.6224	67.7560	67.3462	66.9100	66.6051	66.2892
Feb	5.3751	5.3864	5.3975	5.4506	5.4607	5.5082	5.5082	5.5171	5.4897	5.4607	5.4403	5.4193
util living area	0.9991	0.9983	0.9957	0.9847	0.9448	0.8281	0.6606	0.7169	0.9238	0.9909	0.9983	0.9994 (86)
MIT	19.7943	19.9076	20.1236	20.4260	20.7112	20.9138	20.9807	20.9703	20.8206	20.4529	20.0733	19.7765 (87)
Th 2	20.0351	20.0374	20.0396	20.0499	20.0519	20.0609	20.0609	20.0626	20.0575	20.0519	20.0480	20.0439 (88)
util rest of house	0.9989	0.9978	0.9940	0.9781	0.9189	0.7508	0.5349	0.5946	0.8771	0.9859	0.9976	0.9991 (89)
MIT 2	18.9268	19.0418	19.2589	19.5665	19.8399	20.0164	20.0554	20.0530	19.9459	19.5967	19.2160	18.9161 (90)
Living area fraction												0.3579 (91)
MIT	19.2373	19.3517	19.5684	19.8742	20.1518	20.3376	20.3866	20.3813	20.2590	19.9032	19.5229	19.2240 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2373	19.3517	19.5684	19.8742	20.1518	20.3376	20.3866	20.3813	20.2590	19.9032	19.5229	19.2240 (93)

8. Space heating requirement

Utilisation	0.9985	0.9972	0.9929	0.9766	0.9222	0.7760	0.5806	0.6390	0.8891	0.9849	0.9971	0.9989 (94)
Useful gains	357.9737	394.1823	431.5818	464.3290	459.8484	377.3468	269.3169	278.6312	358.2454	358.8305	341.4544	341.4728 (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	1121.6185	1082.3582	976.2792	810.0536	622.4567	418.1124	275.9385	289.5542	450.6581	685.1590	919.1050	1116.8498 (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	568.1517	462.4542	405.2549	248.9216	120.9806	0.0000	0.0000	0.0000	0.0000	242.7884	415.9084	576.8805 (98)
Space heating												3041.3402 (98)
Space heating per m2												42.8599 (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	684.9968	539.2528	552.7352	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8261	0.9020	0.8763	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	565.8797	486.4220	484.3465	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	654.0230	626.2270	595.5191	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.4632	104.0149	82.7125	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												250.1905 (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)

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	15.8658	26.0037	20.6781	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													62.5476 (107)
Space cooling per m2													0.8814 (108)
Energy for space heating													42.8599 (99)
Energy for space cooling													0.8814 (108)
Total													43.7414 (109)
Target Fabric Energy Efficiency (TFEE)													50.3 (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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	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					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					3.3500							
Infiltration rate					0.1675 (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) =				0.1298 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 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	0.1363	0.1298	0.1298	0.1201	0.1201	0.1071	0.1103	0.1039	0.1071	0.1136	0.1136	0.1233 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Flat	70.9600		70.9600	0.1500	10.6440		(30)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	33.2514		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Floor 1			70.9600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4942 (36)
Total fabric heat loss							(33) + (36) = 47.7456 (37)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
RHI water heating demand	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)
Heat gains from water heating, kWh/month													
	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West				6.6800	22.3313		0.4500		0.0000		0.7700		51.6885 (80)
Solar gains	51.6885	90.9534	147.6923	221.3484	263.7460	288.7182	271.9842	239.2816	185.9848	115.1712	66.0257	42.0937	(83)
Total gains	569.7145	604.2133	640.3036	682.4992	693.0515	689.7821	656.8833	632.6347	597.7880	558.6361	544.3260	546.3950	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711		
alpha	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314		
util living area	0.9902	0.9854	0.9686	0.9159	0.7812	0.5393	0.3570	0.3822	0.6917	0.9250	0.9807	0.9919	(86)	
MIT	20.1378	20.2308	20.4475	20.7088	20.9122	20.9903	20.9992	20.9988	20.9645	20.7364	20.3926	20.1080	(87)	
Th 2	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	(88)	
util rest of house	0.9871	0.9807	0.9580	0.8873	0.7149	0.4395	0.2454	0.2667	0.5942	0.8929	0.9733	0.9893	(89)	
MIT 2	19.2610	19.3525	19.5639	19.8081	19.9761	20.0234	20.0263	20.0262	20.0117	19.8378	19.5127	19.2316	(90)	
Living area fraction	19.5748	19.6668	19.8802	20.1305	20.3112	20.3695	20.3745	20.3743	20.3528	20.1595	19.8276	19.5454	(92)	
Temperature adjustment	19.4248	19.5168	19.7302	19.9805	20.1612	20.2195	20.2245	20.2243	20.2028	20.0095	19.6776	19.3954	(93)	
adjusted MIT														

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	560.8929	590.6179	610.8307	604.5026	502.4004	317.1488	176.1876	183.6960	366.4241	498.4074	527.9207	539.2826	(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	1086.4778	1055.5331	935.1903	764.5623	543.1436	320.0303	176.3038	183.8757	379.4391	637.8245	885.6987	1084.2416	(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	391.0352	312.4230	241.3235	115.2430	30.3129	0.0000	0.0000	0.0000	0.0000	103.7263	257.6001	405.4494	(98)
Space heating													
RHI space heating demand													

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1. Overall dwelling dimensions

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

2. Ventilation rate

	main 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					3.3500
Infiltration rate					0.1675 (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) =				0.1298 (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	0.1655	0.1623	0.1590	0.1428	0.1395	0.1233	0.1233	0.1201	0.1298	0.1395	0.1460	0.1525 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Flat	70.9600		70.9600	0.1500	10.6440		(30)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	33.2514	(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Floor 1			70.9600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4942 (36)
Total fabric heat loss							(33) + (36) = 47.7456 (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	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002	28.1002 (38)
Heat transfer coeff	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457	75.8457 (39)
Average = Sum(39)m / 12 =												75.8457 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689	1.0689 (40)
HLP (average)												1.0689 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West				6.6800	19.6403		0.4500		0.0000		0.7700		45.4597 (80)
Solar gains	45.4597	88.9289	146.4532	213.5933	261.7666	267.9647	255.1134	219.1386	170.3312	105.5216	56.6830	37.3839	(83)
Total gains	563.4857	602.1888	639.0645	674.7442	691.0722	669.0286	640.0124	612.4917	582.1344	548.9865	534.9833	541.6852	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711		
alpha	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314		
util living area	0.9926	0.9882	0.9760	0.9401	0.8505	0.6841	0.5135	0.5571	0.7940	0.9510	0.9866	0.9940	(86)	
MIT	20.0498	20.1590	20.3605	20.6193	20.8421	20.9628	20.9932	20.9897	20.9179	20.6417	20.2928	20.0116	(87)	
Th 2	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	(88)	
util rest of house	0.9902	0.9844	0.9682	0.9197	0.8018	0.5966	0.4041	0.4456	0.7171	0.9301	0.9816	0.9921	(89)	
MIT 2	19.1736	19.2815	19.4794	19.7263	19.9224	20.0096	20.0246	20.0235	19.9833	19.7519	19.4148	19.1357	(90)	
Living area fraction	19.4872	19.5956	19.7948	20.0460	20.2516	20.3508	20.3713	20.3693	20.3179	20.0704	19.7291	19.4492	(91)	
MIT	19.4872	19.5956	19.7948	20.0460	20.2516	20.3508	20.3713	20.3693	20.3179	20.0704	19.7291	19.4492	(92)	
Temperature adjustment	19.3372	19.4456	19.6448	19.8960	20.1016	20.2008	20.2213	20.2193	20.1679	19.9204	19.5791	19.2992	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9881	0.9816	0.9643	0.9165	0.8060	0.6131	0.4264	0.4683	0.7295	0.9273	0.9787	0.9902	(94)
Useful gains	556.7645	591.1060	616.2748	618.3747	557.0126	410.2069	272.9313	286.8359	424.6525	509.0751	523.5675	536.3651	(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	1140.5097	1103.2228	996.9751	833.9969	637.2224	424.7966	274.6639	289.6797	460.2213	706.9115	946.4832	1145.2125	(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	434.3064	344.1425	283.2410	155.2480	59.6761	0.0000	0.0000	0.0000	0.0000	147.1903	304.4993	452.9825	(98)
Space heating												2181.2861	(98)
Space heating per m2												30.7397	(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													2410.2609 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	434.3064	344.1425	283.2410	155.2480	59.6761	0.0000	0.0000	0.0000	0.0000	147.1903	304.4993	452.9825	(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)	479.8966	380.2680	312.9735	171.5447	65.9404	0.0000	0.0000	0.0000	0.0000	162.6412	336.4633	500.5331	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Efficiency of water heater (217)m	89.6245	89.5585	89.3969	89.0340	88.3232	87.3000	87.3000	87.3000	87.3000	88.9619	89.4584	87.3000	(216)
Fuel for water heating, kWh/month	176.0624	154.5265	160.7791	142.2138	138.6578	122.6961	115.3229	130.0199	130.8860	147.7203	158.4612	170.9063	(219)
Water heating fuel used												1748.2524	(219)
Annual totals kWh/year													
Space heating fuel - main system												2410.2609	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													38.2298 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													113.2298 (231)
Electricity for lighting (calculated in Appendix L)													367.3218 (232)
Total delivered energy for all uses													4639.0649 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2410.2609	3.4800	83.8771 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1748.2524	3.4800	60.8392 (247)
Mechanical ventilation fans	38.2298	13.1900	5.0425 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	367.3218	13.1900	48.4497 (250)
Additional standing charges			120.0000 (251)
Total energy cost			328.1010 (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] =	1.1884 (257)
SAP value		83.4224
SAP rating (Section 12)		83 (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	2410.2609	0.2160	520.6163 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1748.2524	0.2160	377.6225 (264)
Space and water heating			898.2389 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1147.6451 (272)
CO2 emissions per m2			16.1700 (273)
EI value			86.7381
EI rating			87 (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	$3.48 / 0.8860 = 3.928$, stars = 4
Water heating environmental impact	$0.216 / 0.8860 = 0.2438$, 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	70.9600 (1b)	x 2.4000 (2b)	= 170.3040 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.3040 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	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					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					3.3500							
Number of sides sheltered					0.1675 (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) =		0.1298 (21)							
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 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	0.1363	0.1298	0.1298	0.1201	0.1201	0.1071	0.1103	0.1039	0.1071	0.1136	0.1136	0.1233 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.6800	1.2357	8.2548		(27)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Flat	70.9600		70.9600	0.1500	10.6440		(30)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	33.2514	(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Floor 1			70.9600				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4942 (36)
Total fabric heat loss							(33) + (36) = 47.7456 (37)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	(61)
Total heat required for water heating calculated for each month	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Heat gains from water heating, kWh/month	51.3044	44.9669	46.6328	40.9831	39.5676	34.5023	32.3265	36.5900	36.8771	42.5396	46.0121	49.7941	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	136.1522	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9982	46.1843	37.5596	28.4351	21.2555	17.9448	19.3900	25.2039	33.8286	42.9532	50.1327	53.4434	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.8018	300.8920	293.1047	276.5264	255.5992	235.9307	222.7909	219.7006	227.4880	244.0663	264.9934	284.6620	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	50.8844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	-90.7682	(71)
Water heating gains (Table 5)	68.9575	66.9150	62.6784	56.9209	53.1822	47.9199	43.4497	49.1801	51.2182	57.1769	63.9057	66.9275	(72)
Total internal gains	518.0260	513.2599	492.6113	461.1509	429.3055	401.0639	384.8991	393.3531	411.8032	443.4648	478.3003	504.3014	(73)

6. Solar gains

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

West				6.6800	22.3313	0.4500		0.0000		0.7700	51.6885 (80)		

Solar gains	51.6885	90.9534	147.6923	221.3484	263.7460	288.7182	271.9842	239.2816	185.9848	115.1712	66.0257	42.0937	(83)
Total gains	569.7145	604.2133	640.3036	682.4992	693.0515	689.7821	656.8833	632.6347	597.7880	558.6361	544.3260	546.3950	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	64.9711	
alpha	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	5.3314	
util living area	0.9902	0.9854	0.9686	0.9159	0.7812	0.5393	0.3570	0.3822	0.6917	0.9250	0.9807	0.9919	(86)
MIT	20.1378	20.2308	20.4475	20.7088	20.9122	20.9903	20.9992	20.9988	20.9645	20.7364	20.3926	20.1080	(87)
Th 2	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	20.0264	(88)
util rest of house	0.9871	0.9807	0.9580	0.8873	0.7149	0.4395	0.2454	0.2667	0.5942	0.8929	0.9733	0.9893	(89)
MIT 2	19.2610	19.3525	19.5639	19.8081	19.9761	20.0234	20.0263	20.0262	20.0117	19.8378	19.5127	19.2316	(90)
Living area fraction	19.5748	19.6668	19.8802	20.1305	20.3112	20.3695	20.3745	20.3743	20.3528	20.1595	19.8276	19.5454	(91)
MIT	19.4248	19.5168	19.7302	19.9805	20.1612	20.2195	20.2245	20.2243	20.2028	20.0095	19.6776	19.3954	(92)
Temperature adjustment												-0.1500	
adjusted MIT												19.3954	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9845	0.9775	0.9540	0.8857	0.7249	0.4598	0.2682	0.2904	0.6130	0.8922	0.9699	0.9870	(94)
Ext temp.	5.1000	5.6000	6.1000	6.4000	6.5000	6.8000	7.1000	7.4000	7.6000	7.8000	8.0000	8.2000	(95)
Heat loss rate W	1086.4778	1055.5331	935.1903	764.5623	543.1436	320.0303	176.3038	183.8757	379.4391	637.8245	885.6987	1084.2416	(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	391.0352	312.4230	241.3235	115.2430	30.3129	0.0000	0.0000	0.0000	0.0000	103.7263	257.6001	405.4494	(98)
Space heating												1857.1134	(98)
Space heating per m2												26.1713	(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													2052.0590 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	391.0352	312.4230	241.3235	115.2430	30.3129	0.0000	0.0000	0.0000	0.0000	103.7263	257.6001	405.4494	(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)	432.0831	345.2187	266.6558	127.3404	33.4949	0.0000	0.0000	0.0000	0.0000	114.6147	284.6410	448.0104	(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	157.7951	138.3916	143.7316	126.6186	122.4670	107.1137	100.6769	113.5074	114.2635	131.4148	141.7568	153.2501	(64)
Efficiency of water heater	89.5562	89.4930	89.2784	88.7960	87.9168	87.3000	87.3000	87.3000	87.3000	88.6833	89.3376	87.3000	(216)
(217)m	89.5562	89.4930	89.2784	88.7960	87.9168	87.3000	87.3000	87.3000	87.3000	88.6833	89.3376	89.5991	(217)
Fuel for water heating, kWh/month	176.1967	154.6396	160.9925	142.5949	139.2988	122.6961	115.3229	130.0199	130.8860	148.1844	158.6753	171.0398	(219)
Water heating fuel used												1750.5470	(219)
Annual totals kWh/year													
Space heating fuel - main system												2052.0590	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)												38.2298	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												113.2298	(231)
Electricity for lighting (calculated in Appendix L)												367.3218	(232)
Total delivered energy for all uses												4283.1576	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2052.0590	3.6300	74.4897 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1750.5470	3.6300	63.5449 (247)
Mechanical ventilation fans	38.2298	19.4400	7.4319 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	367.3218	19.4400	71.4073 (250)
Additional standing charges			95.0000 (251)
Total energy cost			326.4538 (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	2052.0590	0.2160	443.2447 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1750.5470	0.2160	378.1181 (264)
Space and water heating			821.3629 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1070.7692 (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	2052.0590	1.2200	2503.5120 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1750.5470	1.2200	2135.6673 (264)
Space and water heating			4639.1793 (265)
Pumps and fans	113.2298	3.0700	347.6156 (267)
Energy for lighting	367.3218	3.0700	1127.6778 (268)
Primary energy kWh/year			6114.4727 (272)
Primary energy kWh/m2/year			86.1679 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 87

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 83
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 490 TEST (31 Jan 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£93	£93	£0
Mains gas	£233	£233	£0
Space heating	£192	£192	£0
Water heating	£64	£64	£0
Lighting	£71	£71	£0
Total cost of fuels	£326	£326	£0
Total cost of uses	£327	£327	£0
Delivered energy	60 kWh/m²	60 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	86 kWh/m²	86 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

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

Overheating Calculation

Summer ventilation heat loss coefficient	337.20 (P1)
Transmission heat loss coefficient	47.75 (37)
Summer heat loss coefficient	384.95 (P2)

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

Solar gains	Jun	Jul	Aug	
Internal gains	337	318	280	(P4)
Total summer gains	398	382	390	(P5)
Summer gain/loss ratio	1.91	1.82	1.74	(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	18.16	19.97	19.79	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			