

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025x_073_As_Built				Issued on Date	11/01/2022
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	83 B	DER	18.50	TER	19.42	
Environmental	87 B	% DER<TER	4.74			
CO ₂ Emissions (t/year)	1.07	DFEE	46.51	TFEE	51.67	
General Requirements Compliance	Pass	% DFEE<TFEE	9.99			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Mid-floor flat, total floor area 71 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.42 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.50 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 46.5 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	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
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: 3.39 (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 North 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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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					3.3900
Infiltration rate					0.1695 (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) =				0.1314 (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	0.1675	0.1642	0.1609	0.1445	0.1412	0.1248	0.1248	0.1215	0.1314	0.1412	0.1478	0.1544 (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)	
FT-03			70.9600	0.1247	8.8453		(28b)	
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)	
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)	
Total net area of external elements Aum(A, m2)			125.4400				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.4527		(33)	
Party Wall 1			24.8600	0.0000	0.0000		(32)	
Party Ceilings 1			70.9600				(32b)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						250.0000 (35)		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						13.5974 (36)		
Total fabric heat loss						(33) + (36) = 45.0501 (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	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0908	12.7070	14.0363	13.5471	13.9722	13.4909	13.9216	13.9544	13.5215	14.0097	13.6000	14.0802	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	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	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	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	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	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			

Northwest				6.6800	11.2829	0.4500		0.0000		0.7700		26.1157 (81)	

Solar gains	26.1157	53.1593	95.7762	157.2920	211.4313	225.4081	210.8647	168.1038	116.7048	64.9649	32.8603	21.3274	(83)
Total gains	375.4377	400.1838	429.8967	470.8976	504.4053	498.6175	471.3783	434.6028	393.9093	362.8855	354.4028	360.3938	(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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910
util living area												
	0.9989	0.9982	0.9958	0.9851	0.9416	0.8181	0.6537	0.7213	0.9296	0.9909	0.9980	0.9992 (86)
MIT	19.8547	19.9471	20.1442	20.4301	20.7222	20.9185	20.9814	20.9689	20.8126	20.4573	20.1029	19.8246 (87)
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577 (88)
util rest of house												
	0.9986	0.9976	0.9942	0.9788	0.9147	0.7390	0.5283	0.5984	0.8853	0.9860	0.9972	0.9989 (89)
MIT 2	19.0055	19.0978	19.2942	19.5770	19.8547	20.0161	20.0524	20.0476	19.9399	19.6058	19.2535	18.9754 (90)
Living area fraction									fLA = Living area / (4) =			0.3579 (91)
MIT	19.3094	19.4018	19.5985	19.8824	20.1652	20.3391	20.3850	20.3773	20.2523	19.9106	19.5575	19.2794 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.1594	19.2518	19.4485	19.7324	20.0152	20.1891	20.2350	20.2273	20.1023	19.7606	19.4075	19.1294 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9981	0.9969	0.9928	0.9759	0.9132	0.7514	0.5532	0.6225	0.8879	0.9839	0.9964	0.9985	(94)
Useful gains	374.7202	398.9402	426.8103	459.5426	460.6071	374.6757	260.7756	270.5214	349.7578	357.0428	353.1145	359.8451	(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	1086.9727	1049.8377	947.1842	792.3928	608.2624	408.8449	265.8976	279.9710	439.0669	670.1001	900.2992	1092.0868	(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	529.9159	437.4031	387.1581	239.6521	109.8556	0.0000	0.0000	0.0000	0.0000	232.9146	393.9730	544.7878	(98)
Space heating												2875.6603	(98)
Space heating per m2												40.5251	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3177.5252 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.9159	437.4031	387.1581	239.6521	109.8556	0.0000	0.0000	0.0000	0.0000	232.9146	393.9730	544.7878	(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)	585.5424	483.3184	427.7991	264.8090	121.3874	0.0000	0.0000	0.0000	0.0000	257.3642	435.3292	601.9755	(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	89.7452	89.7097	89.6107	89.3676	88.7845	87.3000	87.3000	87.3000	87.3000	89.3191	89.6307	87.3000	(216)
Fuel for water heating, kWh/month	175.8256	154.2662	160.3955	141.6830	137.9374	122.6961	115.3229	130.0199	130.8860	147.1296	158.1565	170.6999	(219)
Water heating fuel used												1745.0187	(219)
Annual totals kWh/year													
Space heating fuel - main system												3177.5252	(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													5403.0955 (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	3177.5252	0.2160	686.3454	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1745.0187	0.2160	376.9240	(264)
Space and water heating			1063.2695	(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			1312.6758	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.5000	(273)

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

DER			18.5000	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			37.6068	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			37.6068	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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)
FT-03			70.9600	0.1300	9.2248		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876		(29a)
Total net area of external elements Aum(A, 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)							12.6855 (36)
Total fabric heat loss						(33) + (36) =	41.1088 (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	74.1917	73.9982	73.8085	72.9177	72.7511	71.9752	71.9752	71.8315	72.2740	72.7511	73.0882	73.4407 (39)
Average = Sum(39)m / 12 =												72.9169 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0455	1.0428	1.0401	1.0276	1.0252	1.0143	1.0143	1.0123	1.0185	1.0252	1.0300	1.0350 (40)
HLP (average)												1.0276 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	

Northwest				6.6800	11.2829	0.6300	0.7000			0.7700	23.0341 (81)	

Solar gains	23.0341	46.8865	84.4746	138.7315	186.4824	198.8100	185.9826	148.2675	102.9336	57.2990	28.9828	18.8108 (83)
Total gains	384.2142	405.1733	429.2648	462.4162	488.9409	480.9111	455.3943	424.2571	390.2260	365.8983	361.7926	369.7389 (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	66.4196	66.5932	66.7643	67.5800	67.7348	68.4649	68.4649	68.6019	68.1818	67.7348	67.4223	67.0987	
alpha	5.4280	5.4395	5.4510	5.5053	5.5157	5.5643	5.5643	5.5735	5.5455	5.5157	5.4948	5.4732	
util living area	0.9988	0.9981	0.9959	0.9862	0.9474	0.8288	0.6645	0.7258	0.9302	0.9905	0.9978	0.9990	(86)
MIT	19.8461	19.9377	20.1320	20.4230	20.7111	20.9158	20.9809	20.9695	20.8160	20.4662	20.1138	19.8315	(87)
Th 2	20.0456	20.0478	20.0500	20.0604	20.0624	20.0714	20.0714	20.0731	20.0679	20.0624	20.0584	20.0543	(88)
util rest of house	0.9984	0.9975	0.9943	0.9803	0.9225	0.7521	0.5397	0.6045	0.8863	0.9854	0.9969	0.9987	(89)
MIT 2	18.4951	18.6307	18.9160	19.3457	19.7503	20.0076	20.0633	20.0584	19.8982	19.4121	18.8962	18.4801	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	(91)
MIT	18.9787	19.0986	19.3513	19.7313	20.0942	20.3327	20.3918	20.3845	20.2267	19.7894	19.3320	18.9638	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9787	19.0986	19.3513	19.7313	20.0942	20.3327	20.3918	20.3845	20.2267	19.7894	19.3320	18.9638	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9977	0.9965	0.9927	0.9776	0.9236	0.7760	0.5849	0.6482	0.8953	0.9834	0.9959	0.9982	(94)
Ext temp.	383.3430	403.7737	426.1260	452.0350	451.5686	373.2063	266.3536	274.9856	349.3799	359.8170	360.2944	369.0630	(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	1089.0393	1050.6678	948.5332	789.7926	610.6892	412.6114	272.9134	286.2141	442.8003	668.5378	894.0185	1084.2634	(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	525.0380	434.7128	388.6710	243.1855	118.3857	0.0000	0.0000	0.0000	0.0000	229.6883	384.2814	532.1091	(98)
Space heating per m ²												2856.0717	(98)
												40.2490	(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)
---	--------------

FULL SAP CALCULATION PRINTOUT

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													3057.8927 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	525.0380	434.7128	388.6710	243.1855	118.3857	0.0000	0.0000	0.0000	0.0000	229.6883	384.2814	532.1091	(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)	562.1392	465.4313	416.1359	260.3699	126.7513	0.0000	0.0000	0.0000	0.0000	245.9189	411.4362	569.7099	(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	87.4428	87.3295	86.9963	86.1703	84.4513	80.3000	80.3000	80.3000	80.3000	85.9115	86.9872	87.5199	(216)
Fuel for water heating, kWh/month	220.8129	193.1359	201.7151	180.6262	178.4377	165.2825	158.3532	176.5268	178.4763	189.9563	200.2671	215.4375	(219)
Water heating fuel used												2259.0275	(219)
Annual totals kWh/year													
Space heating fuel - main system													3057.8927 (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													5759.2419 (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	3057.8927	0.2160	660.5048 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2259.0275	0.2160	487.9499 (264)
Space and water heating			1148.4547 (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			1378.0197 (272)
Emissions per m2 for space and water heating			16.1845 (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) = (16.1845 * 1.00) + 2.6866 + 0.5485, rounded to 2 d.p.			19.4200 (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) =				30.0000 / (5) =	0.1762 (8)
Pressure test				Yes	
Measured/design AP50				3.3900	
Infiltration rate				0.3457	(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) =		0.2679 (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	0.3416	0.3349	0.3282	0.2947	0.2880	0.2545	0.2545	0.2478	0.2679	0.2880	0.3014	0.3148 (22b)
Effective ac	0.5583	0.5561	0.5538	0.5434	0.5415	0.5324	0.5324	0.5307	0.5359	0.5415	0.5454	0.5495 (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)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum, m ²			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss						(33) + (36) =	45.0501 (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	31.3782	31.2509	31.1262	30.5401	30.4305	29.9201	29.9201	29.8255	30.1167	30.4305	30.6523	30.8842 (38)
Heat transfer coeff	76.4283	76.3011	76.1763	75.5902	75.4806	74.9702	74.9702	74.8756	75.1668	75.4806	75.7024	75.9343 (39)
Average = Sum(39)m / 12 =												75.5897 (39)
HLP	1.0771	1.0753	1.0735	1.0653	1.0637	1.0565	1.0565	1.0552	1.0593	1.0637	1.0668	1.0701 (40)
HLP (average)												1.0652 (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	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			
Northwest				6.6800	11.2829	0.4500		0.0000			0.7700			26.1157 (81)
Solar gains	26.1157	53.1593	95.7762	157.2920	211.4313	225.4081	210.8647	168.1038	116.7048	64.9649	32.8603	21.3274	(83)	
Total gains	344.5248	370.0128	401.2616	444.3485	479.2111	475.3294	449.7075	410.8569	369.4240	336.2416	325.3211	330.2158	(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	64.4758	64.5833	64.6891	65.1907	65.2854	65.7299	65.7299	65.8128	65.5579	65.2854	65.0941	64.8953	
alpha	5.2984	5.3056	5.3126	5.3460	5.3524	5.3820	5.3820	5.3875	5.3705	5.3524	5.3396	5.3264	
util living area	0.9993	0.9988	0.9971	0.9890	0.9549	0.8472	0.6907	0.7608	0.9474	0.9939	0.9987	0.9994	(86)
MIT	19.7498	19.8476	20.0545	20.3613	20.6714	20.8962	20.9741	20.9571	20.7730	20.3938	20.0225	19.7299	(87)
Th 2	20.0196	20.0211	20.0225	20.0293	20.0306	20.0365	20.0365	20.0376	20.0342	20.0306	20.0280	20.0253	(88)
util rest of house	0.9990	0.9984	0.9959	0.9842	0.9324	0.7720	0.5603	0.6366	0.9107	0.9904	0.9981	0.9993	(89)
MIT 2	18.8698	18.9687	19.1763	19.4863	19.7859	19.9818	20.0289	20.0231	19.8867	19.5212	19.1492	18.8546	(90)
Living area fraction	19.1848	19.2833	19.4906	19.7995	20.1028	20.3091	20.3672	20.3574	fLA = Living area / (4) =	20.2040	19.8336	19.4618	0.3579 (91)
MIT	19.1848	19.2833	19.4906	19.7995	20.1028	20.3091	20.3672	20.3574	20.2040	19.8336	19.4618	19.1679	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1848	19.2833	19.4906	19.7995	20.1028	20.3091	20.3672	20.3574	20.2040	19.8336	19.4618	19.1679	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9988	0.9979	0.9951	0.9827	0.9344	0.7960	0.6079	0.6817	0.9187	0.9894	0.9977	0.9990	(94)
Ext temp.	344.0962	369.2455	399.2829	436.6518	447.7843	378.3445	273.3711	280.1010	339.3960	332.6889	324.5675	329.8917	(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	1137.6193	1097.4592	989.5780	823.8950	634.2517	428.0138	282.4296	296.3119	458.8153	696.9543	935.8166	1136.5771	(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	590.3812	489.3596	439.1796	278.8151	138.7317	0.0000	0.0000	0.0000	0.0000	271.0134	440.0994	600.1739	(98)
Space heating per m2												3247.7540	(98)
												45.7688	(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	704.7195	554.7792	569.0549	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8009	0.8802	0.8412	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	564.4403	488.3328	478.7088	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	641.2398	609.6935	566.0921	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	55.2956	90.2923	65.0131	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												210.6011	(104)
Cooled fraction												1.0000	(105)

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

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

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	13.8239	22.5731	16.2533	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											52.6503 (107)
Space cooling per m2											0.7420 (108)
Energy for space heating											45.7688 (99)
Energy for space cooling											0.7420 (108)
Total											46.5108 (109)
Dwelling Fabric Energy Efficiency (DFEE)											46.5 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1762 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4262 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3303 (21)

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

3. Heat losses and heat loss parameter

Element	Gross 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)
FT-03			70.9600	0.1300	9.2248		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.1800	3.9348		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.1800	4.2876		(29a)
Total net area of external elements Aum(A, 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)							12.6855 (36)
Total fabric heat loss						(33) + (36) =	41.1088 (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	74.1917	73.9982	73.8085	72.9177	72.7511	71.9752	71.9752	71.8315	72.2740	72.7511	73.0882	73.4407 (39)
Average = Sum(39)m / 12 =												72.9169 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0455	1.0428	1.0401	1.0276	1.0252	1.0143	1.0143	1.0123	1.0185	1.0252	1.0300	1.0350 (40)
HLP (average)												1.0276 (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 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	

Northwest					6.6800	11.2829	0.6300	0.7000			0.7700	23.0341 (81)	

Solar gains	23.0341	46.8865	84.4746	138.7315	186.4824	198.8100	185.9826	148.2675	102.9336	57.2990	28.9828	18.8108 (83)	
Total gains	341.4432	363.7400	389.9600	425.7881	454.2623	448.7312	424.8255	391.0207	355.6529	328.5758	321.4436	327.6992 (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	66.4196	66.5932	66.7643	67.5800	67.7348	68.4649	68.4649	68.6019	68.1818	67.7348	67.4223	67.0987
alpha	5.4280	5.4395	5.4510	5.5053	5.5157	5.5643	5.5643	5.5735	5.5455	5.5157	5.4948	5.4732
util living area	0.9993	0.9989	0.9974	0.9905	0.9606	0.8585	0.7022	0.7685	0.9506	0.9943	0.9988	0.9995 (86)
MIT	19.7887	19.8823	20.0799	20.3766	20.6746	20.8977	20.9750	20.9594	20.7822	20.4178	20.0598	19.7749 (87)
Th 2	20.0456	20.0478	20.0500	20.0604	20.0624	20.0714	20.0714	20.0731	20.0679	20.0624	20.0584	20.0543 (88)
util rest of house	0.9991	0.9985	0.9964	0.9863	0.9406	0.7874	0.5751	0.6483	0.9161	0.9911	0.9983	0.9993 (89)
MIT 2	18.9297	19.0250	19.2241	19.5273	19.8171	20.0165	20.0639	20.0590	19.9248	19.5711	19.2111	18.9230 (90)
Living area fraction									fLA = Living area / (4) =			0.3579 (91)
MIT	19.2372	19.3319	19.5304	19.8313	20.1240	20.3319	20.3900	20.3813	20.2317	19.8742	19.5149	19.2279 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2372	19.3319	19.5304	19.8313	20.1240	20.3319	20.3900	20.3813	20.2317	19.8742	19.5149	19.2279 (93)

8. Space heating requirement

Utilisation	0.9988	0.9981	0.9957	0.9850	0.9422	0.8099	0.6215	0.6920	0.9236	0.9902	0.9978	0.9991 (94)
Useful gains	341.0467	363.0545	388.2639	419.3957	427.9912	363.4231	264.0101	270.5767	328.4781	325.3602	320.7497	327.3998 (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	1108.2158	1067.9317	961.7573	797.0845	612.8582	412.5549	272.7894	285.9841	443.1653	674.7049	907.3807	1103.6606 (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	570.7738	473.6775	426.6791	271.9359	137.5410	0.0000	0.0000	0.0000	0.0000	259.9125	422.3743	577.5381 (98)
Space heating												3140.4322 (98)
Space heating per m2												(98) / (4) = 44.2564 (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	676.5669	532.6165	545.9196	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8007	0.8817	0.8455	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	541.7123	469.6193	461.5844	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	610.1510	580.6106	542.9069	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	49.2759	82.5775	60.5039	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												192.3574 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)

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	12.3190	20.6444	15.1260	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													48.0893 (107)
Space cooling per m2													0.6777 (108)
Energy for space heating													44.2564 (99)
Energy for space cooling													0.6777 (108)
Total													44.9341 (109)
Target Fabric Energy Efficiency (TFEE)													51.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.3900
Infiltration rate					0.1695 (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) =				0.1314 (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	0.1379	0.1314	0.1314	0.1215	0.1215	0.1084	0.1117	0.1051	0.1084	0.1149	0.1149	0.1248 (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)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss							(33) + (36) = 45.0501 (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	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (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	96.9030	93.3792	89.8555	86.3317	82.8080	79.2842	79.2842	82.8080	86.3317	89.8555	93.3792	96.9030 (44)
Energy conte	143.7043	125.6847	129.6953	113.0715	108.4948	93.6228	86.7553	99.5529	100.7419	117.4050	128.1567	139.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1386.0553 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5556	18.8527	19.4543	16.9607	16.2742	14.0434	13.0133	14.9329	15.1113	17.6108	19.2235	20.8755 (46)

FULL SAP CALCULATION PRINTOUT

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

Northwest					6.6800	12.9236	0.4500	0.0000			0.7700	29.9131 (81)

Solar gains	29.9131	55.0796	98.3837	166.2932	216.9720	246.9896	228.7892	187.1782	129.9528	72.0073	38.6255	24.1490 (83)
Total gains	547.9391	568.3395	590.9950	627.4441	646.2775	648.0535	613.6883	580.5313	541.7560	515.4721	516.9258	528.4504 (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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651		
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910		
util living area	0.9915	0.9883	0.9759	0.9321	0.8010	0.5535	0.3685	0.4016	0.7274	0.9392	0.9836	0.9928	(86)	
MIT	20.1615	20.2359	20.4344	20.6927	20.9087	20.9904	20.9992	20.9987	20.9591	20.7247	20.4014	20.1363	(87)	
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	(88)	
util rest of house	0.9887	0.9844	0.9675	0.9077	0.7378	0.4546	0.2571	0.2843	0.6321	0.9118	0.9773	0.9904	(89)	
MIT 2	19.3103	19.3838	19.5786	19.8230	20.0043	20.0547	20.0576	20.0575	20.0402	19.8565	19.5479	19.2855	(90)	
Living area fraction	19.6150	19.6888	19.8849	20.1343	20.3280	20.3896	20.3946	20.3944	20.3691	20.1673	19.8534	19.5900	(92)	
MIT	19.6150	19.6888	19.8849	20.1343	20.3280	20.3896	20.3946	20.3944	20.3691	20.1673	19.8534	19.5900	(92)	
Temperature adjustment	19.4650	19.5388	19.7349	19.9843	20.1780	20.2396	20.2446	20.2444	20.2191	20.0173	19.7034	19.4400	(93)	
adjusted MIT	19.4650	19.5388	19.7349	19.9843	20.1780	20.2396	20.2446	20.2444	20.2191	20.0173	19.7034	19.4400	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9864	0.9817	0.9639	0.9055	0.7467	0.4742	0.2793	0.3077	0.6497	0.9104	0.9742	0.9884	(94)
Ext temp.	540.4874	557.9475	569.6578	568.1552	482.5503	307.2802	171.3981	178.6177	351.9613	469.2620	503.5905	522.3019	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Month fracti	1050.8030	1019.6287	902.3038	737.6701	525.0761	310.1306	171.5108	178.8102	367.1519	615.7275	856.1054	1048.9774	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating RHI space heating demand	379.6748	310.2498	247.4886	122.0507	31.6392	0.0000	0.0000	0.0000	0.0000	108.9704	253.8108	391.8466	(98)
												1845.7307	(98)
												1846	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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					3.3900
Infiltration rate					0.1695 (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) =				0.1314 (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	0.1675	0.1642	0.1609	0.1445	0.1412	0.1248	0.1248	0.1215	0.1314	0.1412	0.1478	0.1544 (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)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss							(33) + (36) = 45.0501 (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	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 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

Northwest				6.6800	11.2829	0.4500	0.0000				0.7700			26.1157 (81)

Solar gains	26.1157	53.1593	95.7762	157.2920	211.4313	225.4081	210.8647	168.1038	116.7048	64.9649	32.8603	21.3274	(83)	
Total gains	544.1417	566.4192	588.3874	618.4428	640.7368	626.4720	595.7637	561.4568	528.5080	508.4297	511.1606	525.6288	(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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651		
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910		
util living area	0.9934	0.9906	0.9821	0.9534	0.8701	0.7024	0.5316	0.5843	0.8258	0.9609	0.9885	0.9946	(86)	
MIT	20.0786	20.1658	20.3468	20.6002	20.8339	20.9619	20.9931	20.9886	20.9076	20.6317	20.3080	20.0447	(87)	
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	(88)	
util rest of house	0.9914	0.9876	0.9761	0.9367	0.8254	0.6167	0.4223	0.4723	0.7543	0.9435	0.9842	0.9929	(89)	
MIT 2	19.2281	19.3144	19.4929	19.7372	19.9461	20.0403	20.0559	20.0544	20.0075	19.7707	19.4560	19.1944	(90)	
Living area fraction									fLA = Living area / (4) =			0.3579	(91)	
MIT	19.5325	19.6192	19.7986	20.0461	20.2639	20.3702	20.3914	20.3888	20.3297	20.0789	19.7609	19.4988	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.3825	19.4692	19.6486	19.8961	20.1139	20.2202	20.2414	20.2388	20.1797	19.9289	19.6109	19.3488	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9894	0.9852	0.9727	0.9333	0.8284	0.6324	0.4441	0.4945	0.7647	0.9405	0.9816	0.9912	(94)
Useful gains	538.3956	558.0294	572.3517	577.1987	530.8055	396.1582	264.5845	277.6495	404.1738	478.2004	501.7303	520.9920	(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	1103.2913	1065.7394	961.8220	804.3709	615.4773	411.1163	266.3662	280.8108	444.7297	682.4115	915.1791	1108.1364	(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	420.2824	341.1811	289.7660	163.5640	62.9958	0.0000	0.0000	0.0000	0.0000	151.9331	297.6832	436.8354	(98)
Space heating												2164.2409	(98)
Space heating per m2										(98) / (4) =		30.4994	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2391.4264 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	420.2824	341.1811	289.7660	163.5640	62.9958	0.0000	0.0000	0.0000	0.0000	151.9331	297.6832	436.8354	(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)	464.4004	376.9956	320.1834	180.7337	69.6087	0.0000	0.0000	0.0000	0.0000	167.8818	328.9317	482.6911	(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 (217)m	89.6035	89.5527	89.4133	89.0753	88.3613	87.3000	87.3000	87.3000	87.3000	88.9872	89.4424	87.3000	(216)
Fuel for water heating, kWh/month	176.1037	154.5365	160.7496	142.1478	138.5981	122.6961	115.3229	130.0199	130.8860	147.6783	158.4894	170.9492	(219)
Water heating fuel used												1748.1777	(219)
Annual totals kWh/year													
Space heating fuel - main system												2391.4264	(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													4620.1557 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2391.4264	3.4800	83.2216 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1748.1777	3.4800	60.8366 (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			327.4430 (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] =	1.1860 (257)
SAP value		83.4556
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	2391.4264	0.2160	516.5481 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1748.1777	0.2160	377.6064 (264)
Space and water heating			894.1545 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1143.5608 (272)
CO2 emissions per m2			16.1200 (273)
EI value			86.7853
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	$3.48 / 0.8861 = 3.927$, stars = 4
Water heating environmental impact	$0.216 / 0.8861 = 0.2438$, 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	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					3.3900
Infiltration rate					0.1695 (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) =				0.1314 (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	0.1379	0.1314	0.1314	0.1215	0.1215	0.1084	0.1117	0.1051	0.1084	0.1149	0.1149	0.1248 (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)
FT-03			70.9600	0.1247	8.8453		(28b)
WT-E-02	28.5400	6.6800	21.8600	0.2000	4.3720		(29a)
WT-I-01	25.9400	2.1200	23.8200	0.3300	7.8606		(29a)
Total net area of external elements Aum(A, m2)			125.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.4527		(33)
Party Wall 1			24.8600	0.0000	0.0000		(32)
Party Ceilings 1			70.9600				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5974 (36)
Total fabric heat loss							(33) + (36) = 45.0501 (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	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503	73.1503 (39)
Average = Sum(39)m / 12 =												73.1503 (39)
HLP	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309	1.0309 (40)
HLP (average)												1.0309 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

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

6. Solar gains													
[Jan]	Area	Solar flux	Specific data	Specific data	Access	Gains							
	m2	Table 6a	g	or Table 6b	factor	W							
		W/m2			Table 6d								
Northwest	6.6800	12.9236	0.4500	0.0000	0.7700	29.9131	(81)						
Solar gains	29.9131	55.0796	98.3837	166.2932	216.9720	246.9896	228.7892	187.1782	129.9528	72.0073	38.6255	24.1490	(83)
Total gains	547.9391	568.3395	590.9950	627.4441	646.2775	648.0535	613.6883	580.5313	541.7560	515.4721	516.9258	528.4504	(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	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	67.3651	
alpha	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	5.4910	
util living area	0.9915	0.9883	0.9759	0.9321	0.8010	0.5535	0.3685	0.4016	0.7274	0.9392	0.9836	0.9928	(86)
MIT	20.1615	20.2359	20.4344	20.6927	20.9087	20.9904	20.9992	20.9987	20.9591	20.7247	20.4014	20.1363	(87)
Th 2	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	20.0577	(88)
util rest of house	0.9887	0.9844	0.9675	0.9077	0.7378	0.4546	0.2571	0.2843	0.6321	0.9118	0.9773	0.9904	(89)
MIT 2	19.3103	19.3838	19.5786	19.8230	20.0043	20.0547	20.0576	20.0575	20.0402	19.8565	19.5479	19.2855	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	(91)
MIT	19.6150	19.6888	19.8849	20.1343	20.3280	20.3896	20.3946	20.3944	20.3691	20.1673	19.8534	19.5900	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4650	19.5388	19.7349	19.9843	20.1780	20.2396	20.2446	20.2444	20.2191	20.0173	19.7034	19.4400	(93)

8. Space heating requirement													
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9864	0.9817	0.9639	0.9055	0.7467	0.4742	0.2793	0.3077	0.6497	0.9104	0.9742	0.9884	(94)
Useful gains	540.4874	557.9475	569.6578	568.1552	482.5503	307.2802	171.3981	178.6177	351.9613	469.2620	503.5905	522.3019	(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	1050.8030	1019.6287	902.3038	737.6701	525.0761	310.1306	171.5108	178.8102	367.1519	615.7275	856.1054	1048.9774	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	379.6748	310.2498	247.4886	122.0507	31.6392	0.0000	0.0000	0.0000	0.0000	108.9704	253.8108	391.8466	(98)
Space heating												1845.7307	(98)
Space heating per m2										(98) / (4) =		26.0109	(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												2039.4815 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	379.6748	310.2498	247.4886	122.0507	31.6392	0.0000	0.0000	0.0000	0.0000	108.9704	253.8108	391.8466 (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)	419.5301	342.8174	273.4681	134.8627	34.9604	0.0000	0.0000	0.0000	0.0000	120.4092	280.4539	432.9796 (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	89.5364	89.4882	89.2974	88.8418	87.9384	87.3000	87.3000	87.3000	87.3000	88.7221	89.3266	87.3000 (216)
(217)m	89.5364	89.4882	89.2974	88.8418	87.9384	87.3000	87.3000	87.3000	87.3000	88.7221	89.3266	89.5769 (217)
Fuel for water heating, kWh/month	176.2355	154.6480	160.9582	142.5214	139.2646	122.6961	115.3229	130.0199	130.8860	148.1195	158.6949	171.0823 (219)
Water heating fuel used												1750.4493 (219)
Annual totals kWh/year												
Space heating fuel - main system												2039.4815 (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												4270.4824 (238)

10a. Fuel costs - using BEDF prices (486)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2039.4815	3.7400	76.2766 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1750.4493	3.7400	65.4668 (247)
Mechanical ventilation fans	38.2298	19.1200	7.3095 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	367.3218	19.1200	70.2319 (250)
Additional standing charges			94.0000 (251)
Total energy cost			327.6249 (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	2039.4815	0.2160	440.5280 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1750.4493	0.2160	378.0970 (264)
Space and water heating			818.6250 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1068.0313 (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	2039.4815	1.2200	2488.1674 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1750.4493	1.2200	2135.5481 (264)
Space and water heating			4623.7155 (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			6099.0090 (272)
Primary energy kWh/m2/year			85.9500 (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 486 TEST (30 Nov 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£92	£92	£0
Mains gas	£236	£236	£0
Space heating	£192	£192	£0
Water heating	£65	£65	£0
Lighting	£70	£70	£0
Total cost of fuels	£328	£328	£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	South 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	45.05 (P7)
Summer heat loss coefficient	382.25 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
North 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
North West	6.6800	98.8453	0.4500 0.0000
total:			0.9000 267.4160
			267.4160

Solar gains	Jun	Jul	Aug	(P4)
Internal gains	289	267	219	
Total summer gains	398	382	390	
	687	649	609	(P5)
Summer gain/loss ratio	1.80	1.70	1.59	(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	18.05	19.85	19.64	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			