

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025c_141_As_Built				Issued on Date	01/03/2022
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	83 B	DER	19.05	TER	19.59	
Environmental	86 B	% DER<TER	2.75			
CO ₂ Emissions (t/year)	1.10	DFEE	49.67	TFEE	52.55	
General Requirements Compliance	Pass	% DFEE<TFEE	5.47			
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) 19.59 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.05 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 49.7 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: 4.60 (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

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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		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.6000					
Infiltration rate							0.2300		(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) =	0.1783	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	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)
	0.2273	0.2228	0.2184	0.1961	0.1916	0.1693	0.1693	0.1649	0.1783	0.1916	0.2005	0.2094 (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)
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	

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	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	0.9989	0.9982	0.9959	0.9859	0.9458	0.8305	0.6710	0.7374	0.9348	0.9913	0.9980	0.9991	(86)	
MIT	19.8023	19.8962	20.0978	20.3908	20.6933	20.9042	20.9766	20.9619	20.7917	20.4236	20.0589	19.7720	(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	0.9986	0.9976	0.9944	0.9798	0.9200	0.7517	0.5407	0.6114	0.8920	0.9866	0.9972	0.9989	(89)	
MIT 2	18.9276	19.0215	19.2224	19.5125	19.8014	19.9770	20.0196	20.0138	19.8945	19.5469	19.1841	18.8974	(90)	
Living area fraction	19.2407	19.3346	19.5357	19.8269	20.1207	20.3089	20.3622	20.3532	20.2157	19.8607	19.4972	19.2105	(91)	
MIT	19.2407	19.3346	19.5357	19.8269	20.1207	20.3089	20.3622	20.3532	20.2157	19.8607	19.4972	19.2105	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	19.0907	19.1846	19.3857	19.6769	19.9707	20.1589	20.2122	20.2032	20.0657	19.7107	19.3472	19.0605	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9981	0.9969	0.9929	0.9769	0.9182	0.7640	0.5673	0.6366	0.8942	0.9844	0.9964	0.9984	(94)
Useful gains	374.7074	398.9341	426.8595	460.0145	463.1226	380.9261	267.4005	276.6676	352.2281	357.2299	353.1123	359.8319	(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	1121.8125	1083.4255	977.3291	817.3819	627.2938	421.6190	273.9692	288.4542	452.4696	691.0072	928.8983	1127.1035	(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	555.8463	459.9782	409.5494	257.3045	122.1433	0.0000	0.0000	0.0000	0.0000	248.3303	414.5659	570.8501	(98)
Space heating												3038.5680	(98)
Space heating per m ²												42.8209	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3357.5337 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.8463	459.9782	409.5494	257.3045	122.1433	0.0000	0.0000	0.0000	0.0000	248.3303	414.5659	570.8501	(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)	614.1948	508.2632	452.5408	284.3144	134.9650	0.0000	0.0000	0.0000	0.0000	274.3981	458.0839	630.7736	(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	89.7724	89.7392	89.6464	89.4190	88.8691	87.3000	87.3000	87.3000	87.3000	89.3664	89.6625	87.3000	(216)
Fuel for water heating, kWh/month	175.7723	154.2153	160.3318	141.6014	137.8061	122.6961	115.3229	130.0199	130.8860	147.0516	158.1003	170.6509	(219)
Water heating fuel used												1744.4547	(219)
Annual totals kWh/year													
Space heating fuel - main system												3357.5337	(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													5582.5400 (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	3357.5337	0.2160	725.2273	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1744.4547	0.2160	376.8022	(264)
Space and water heating			1102.0295	(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			1351.4358	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.0500	(273)

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

DER			19.0500	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			38.1568	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			38.1568	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)
					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	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	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	0.9988	0.9981	0.9959	0.9865	0.9488	0.8331	0.6705	0.7315	0.9320	0.9907	0.9978	0.9990	(86)
MIT	19.8287	19.9208	20.1165	20.4098	20.7014	20.9110	20.9793	20.9672	20.8090	20.4549	20.0991	19.8139	(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	0.9984	0.9975	0.9943	0.9806	0.9242	0.7565	0.5441	0.6090	0.8886	0.9856	0.9969	0.9987	(89)
MIT 2	18.4621	18.5984	18.8858	19.3189	19.7289	19.9932	20.0521	20.0468	19.8808	19.3880	18.8670	18.4468	(90)
Living area fraction	18.9512	19.0717	19.3264	19.7094	20.0770	20.3217	20.3840	20.3762	20.2131	19.7699	19.3080	18.9361	(91)
MIT	18.9512	19.0717	19.3264	19.7094	20.0770	20.3217	20.3840	20.3762	20.2131	19.7699	19.3080	18.9361	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9512	19.0717	19.3264	19.7094	20.0770	20.3217	20.3840	20.3762	20.2131	19.7699	19.3080	18.9361	(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	0.9778	0.9250	0.7802	0.5898	0.6531	0.8974	0.9836	0.9959	0.9982	(94)
Ext temp.	383.3377	403.7706	426.1391	452.1712	452.2880	375.1893	268.6140	277.0771	350.1765	359.8817	360.2936	369.0578	(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	1100.1385	1061.3904	958.1969	797.8912	616.9496	416.9543	275.7486	289.1848	447.2986	675.3442	903.2122	1095.4460	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m ²	533.2998	441.9205	395.8510	248.9184	122.5082	0.0000	0.0000	0.0000	0.0000	234.7041	390.9014	540.4328	(98)
												2908.5363	(98)
												40.9884	(99)

8c. Space cooling requirement

Not applicable

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

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

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													3114.0646 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	533.2998	441.9205	395.8510	248.9184	122.5082	0.0000	0.0000	0.0000	0.0000	234.7041	390.9014	540.4328	(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)	570.9848	473.1483	423.8234	266.5079	131.1651	0.0000	0.0000	0.0000	0.0000	251.2891	418.5240	578.6219	(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 (217)m	87.4754	87.3646	87.0375	86.2274	84.5352	80.3000	80.3000	80.3000	80.3000	85.9653	87.0257	87.5517	(216)
Fuel for water heating, kWh/month	220.7307	193.0585	201.6196	180.5064	178.2605	165.2825	158.3532	176.5268	178.4763	189.8374	200.1786	215.3591	(219)
Water heating fuel used												2258.1896	(219)
Annual totals kWh/year													
Space heating fuel - main system												3114.0646	(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												5814.5760	(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	3114.0646	0.2160	672.6379 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2258.1896	0.2160	487.7690 (264)
Space and water heating			1160.4069 (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			1389.9719 (272)
Emissions per m2 for space and water heating			16.3530 (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) = (16.3530 * 1.00) + 2.6866 + 0.5485, rounded to 2 d.p.			19.5900 (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 * 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					4.6000
Infiltration rate					0.4062 (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) =				0.3148 (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	0.4013	0.3935	0.3856	0.3462	0.3384	0.2990	0.2990	0.2912	0.3148	0.3384	0.3541	0.3699 (22b)
Effective ac	0.5805	0.5774	0.5743	0.5599	0.5572	0.5447	0.5447	0.5424	0.5495	0.5572	0.5627	0.5684 (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	32.6262	32.4504	32.2782	31.4690	31.3176	30.6129	30.6129	30.4824	30.8843	31.3176	31.6239	31.9441 (38)
Heat transfer coeff	80.3718	80.1960	80.0237	79.2146	79.0632	78.3585	78.3585	78.2279	78.6299	79.0632	79.3695	79.6896 (39)
Average = Sum(39)m / 12 =												79.2139 (39)
HLP	1.1326	1.1302	1.1277	1.1163	1.1142	1.1043	1.1043	1.1024	1.1081	1.1142	1.1185	1.1230 (40)
HLP (average)												1.1163 (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	

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	61.3123	61.4467	61.5789	62.2080	62.3271	62.8876	62.8876	62.9926	62.6705	62.3271	62.0866	61.8371	
alpha	5.0875	5.0964	5.1053	5.1472	5.1551	5.1925	5.1925	5.1995	5.1780	5.1551	5.1391	5.1225	
util living area	0.9993	0.9988	0.9971	0.9897	0.9587	0.8601	0.7109	0.7784	0.9519	0.9941	0.9987	0.9994	(86)
MIT	19.6750	19.7758	19.9897	20.3092	20.6325	20.8763	20.9665	20.9466	20.7454	20.3499	19.9639	19.6583	(87)
Th 2	19.9743	19.9763	19.9783	19.9875	19.9893	19.9974	19.9974	19.9989	19.9942	19.9893	19.9857	19.9821	(88)
util rest of house	0.9990	0.9983	0.9960	0.9850	0.9374	0.7859	0.5755	0.6518	0.9168	0.9907	0.9981	0.9992	(89)
MIT 2	18.7586	18.8610	19.0760	19.4007	19.7146	19.9315	19.9874	19.9805	19.8278	19.4441	19.0566	18.7482	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	(91)
MIT	19.0867	19.1884	19.4031	19.7259	20.0432	20.2697	20.3379	20.3263	20.1563	19.7683	19.3814	19.0740	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0867	19.1884	19.4031	19.7259	20.0432	20.2697	20.3379	20.3263	20.1563	19.7683	19.3814	19.0740	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	344.0751	369.2233	399.2870	436.9598	449.8650	384.4955	281.0417	286.6966	341.3239	332.7745	324.5498	329.8738	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1188.4301	1145.8755	1032.5517	857.5713	659.6362	444.2669	292.8961	307.1477	476.2042	724.8764	974.7641	1185.3005	(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	628.2001	521.9103	471.1489	302.8403	156.0698	0.0000	0.0000	0.0000	0.0000	291.7238	468.1543	636.4374	(98)
Space heating												3476.4850	(98)
Space heating per m2												48.9922	(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	736.5695	579.8526	594.5324	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7753	0.8588	0.8175	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	571.0983	497.9745	486.0056	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	50.5019	83.1190	59.5843	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												193.2052	(104)
Cooled fraction												1.0000	(105)

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	12.6255	20.7797	14.8961	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											48.3013 (107)
Space cooling per m2											0.6807 (108)
Energy for space heating											48.9922 (99)
Energy for space cooling											0.6807 (108)
Total											49.6729 (109)
Dwelling Fabric Energy Efficiency (DFEE)											49.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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	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		
-----					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	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	0.9993	0.9989	0.9974	0.9907	0.9615	0.8622	0.7080	0.7737	0.9519	0.9944	0.9988	0.9995	(86)
MIT	19.7714	19.8654	20.0646	20.3635	20.6647	20.8924	20.9731	20.9566	20.7750	20.4066	20.0452	19.7574	(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	0.9991	0.9985	0.9964	0.9865	0.9418	0.7913	0.5795	0.6528	0.9178	0.9912	0.9983	0.9993	(89)
MIT 2	18.9040	18.9997	19.2003	19.5057	19.7989	20.0029	20.0528	20.0475	19.9093	19.5514	19.1880	18.8971	(90)
Living area fraction									fLA = Living area / (4) =			0.3579	(91)
MIT	19.2145	19.3096	19.5096	19.8127	20.1088	20.3213	20.3822	20.3730	20.2192	19.8575	19.4948	19.2050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2145	19.3096	19.5096	19.8127	20.1088	20.3213	20.3822	20.3730	20.2192	19.8575	19.4948	19.2050	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9988	0.9981	0.9957	0.9852	0.9433	0.8136	0.6264	0.6967	0.9251	0.9903	0.9978	0.9991	(94)
Ext temp.	341.0425	363.0503	388.2661	419.4700	428.4969	365.0881	266.1190	272.4339	329.0106	325.3857	320.7465	327.3960	(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	1119.9036	1079.2076	971.8900	805.5192	619.2911	416.9228	275.6184	288.9462	447.7459	681.7954	917.0294	1115.4361	(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	579.4727	481.2576	434.2162	277.9554	141.9508	0.0000	0.0000	0.0000	0.0000	265.1688	429.3237	586.3018	(98)
Space heating per m2												3195.6471	(98)
												(98) / (4) =	45.0345 (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	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	0.7935	0.8758	0.8389	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	543.5299	472.2843	463.6681	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	47.9672	80.5948	58.9536	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												187.5156	(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	11.9918	20.1487	14.7384	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												46.8789 (107)
Space cooling per m2												0.6606 (108)
Energy for space heating												45.0345 (99)
Energy for space cooling												0.6606 (108)
Total												45.6951 (109)
Target Fabric Energy Efficiency (TFEE)												52.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
									Air changes per hour			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.6000					
Infiltration rate							0.2300		(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) =	0.1783	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.1872	0.1783	0.1783	0.1649	0.1649	0.1471	0.1515	0.1426	0.1471	0.1560	0.1560	0.1693 (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 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(A, 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	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)
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)
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	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	0.9918	0.9889	0.9774	0.9371	0.8143	0.5707	0.3817	0.4157	0.7433	0.9436	0.9845	0.9931	(86)
MIT	20.1100	20.1859	20.3903	20.6589	20.8919	20.9874	20.9988	20.9982	20.9500	20.6957	20.3591	20.0849	(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	0.9891	0.9851	0.9694	0.9137	0.7512	0.4667	0.2626	0.2906	0.6461	0.9173	0.9784	0.9907	(89)
MIT 2	19.2336	19.3086	19.5095	19.7648	19.9627	20.0224	20.0262	20.0261	20.0048	19.8030	19.4804	19.2089	(90)
Living area fraction	19.5473	19.6226	19.8248	20.0848	20.2953	20.3678	20.3744	20.3741	20.3432	20.1225	19.7950	19.5225	(92)
Temperature adjustment													-0.1500
adjusted MIT	19.3973	19.4726	19.6748	19.9348	20.1453	20.2178	20.2244	20.2241	20.1932	19.9725	19.6450	19.3725	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	540.7219	558.3384	570.7152	571.6654	491.0164	316.1029	176.1305	183.5819	359.8601	471.9296	504.1687	522.4738	(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	1084.3904	1052.1803	930.9881	761.0977	541.9386	319.9041	176.2932	183.8555	378.7099	635.0214	883.2211	1082.5048	(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	404.4893	331.8618	268.0431	136.3913	37.8861	0.0000	0.0000	0.0000	0.0000	121.3403	272.9177	416.6631	(98)
Space heating													
RHI space heating demand													

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					4.6000
Infiltration rate					0.2300 (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) =				0.1783 (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	0.2273	0.2228	0.2184	0.1961	0.1916	0.1693	0.1693	0.1649	0.1783	0.1916	0.2005	0.2094 (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)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
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	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	0.9937	0.9910	0.9831	0.9567	0.8796	0.7189	0.5487	0.6018	0.8379	0.9636	0.9890	0.9947	(86)	
MIT	20.0248	20.1137	20.2997	20.5620	20.8095	20.9530	20.9908	20.9852	20.8919	20.5985	20.2629	19.9907	(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	0.9917	0.9881	0.9773	0.9408	0.8359	0.6312	0.4332	0.4842	0.7669	0.9469	0.9849	0.9931	(89)	
MIT 2	19.1489	19.2370	19.4207	19.6743	19.8975	20.0046	20.0240	20.0221	19.9670	19.7127	19.3856	19.1151	(90)	
Living area fraction	19.4624	19.5508	19.7353	19.9920	20.2239	20.3441	20.3700	20.3669	20.2980	20.0298	19.6996	19.4285	(91)	
MIT	19.3124	19.4008	19.5853	19.8420	20.0739	20.1941	20.2200	20.2169	20.1480	19.8798	19.5496	19.2785	(92)	
Temperature adjustment												-0.1500		
adjusted MIT														

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9897	0.9857	0.9740	0.9371	0.8383	0.6474	0.4568	0.5082	0.7770	0.9438	0.9822	0.9914	(94)
Useful gains	538.5451	558.3097	573.0744	579.5520	537.1501	405.5508	272.1666	285.3264	410.6341	479.8557	502.0808	521.0932	(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	1138.6290	1099.8244	992.4649	829.9065	635.1279	424.2879	274.5651	289.4923	458.7180	703.8296	944.2515	1143.6386	(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	446.4624	363.8978	312.0265	180.2553	72.8955	0.0000	0.0000	0.0000	0.0000	166.6366	318.3629	463.1737	(98)
Space heating												2323.7107	(98)
Space heating per m2												32.7468	(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													2567.6361 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	446.4624	363.8978	312.0265	180.2553	72.8955	0.0000	0.0000	0.0000	0.0000	166.6366	318.3629	463.1737	(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)	493.3286	402.0971	344.7807	199.1771	80.5475	0.0000	0.0000	0.0000	0.0000	184.1288	351.7822	511.7942	(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	89.6419	89.5952	89.4658	89.1516	88.4672	87.3000	87.3000	87.3000	87.3000	89.0606	89.4894	87.3000	(216)
Fuel for water heating, kWh/month	176.0282	154.4633	160.6554	142.0261	138.4321	122.6961	115.3229	130.0199	130.8860	147.5565	158.4062	170.8803	(219)
Water heating fuel used												1747.3731	(219)
Annual totals kWh/year													
Space heating fuel - main system												2567.6361	(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													4795.5608 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2567.6361	3.4800	89.3537 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1747.3731	3.4800	60.8086 (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			333.5471 (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] =	1.2081 (257)
SAP value		83.1472
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	2567.6361	0.2160	554.6094 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1747.3731	0.2160	377.4326 (264)
Space and water heating			932.0420 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1181.4483 (272)
CO2 emissions per m2			16.6500 (273)
EI value			86.3475
EI rating			86 (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	$3.48 / 0.8865 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8865 = 0.2437$, 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		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.6000					
Infiltration rate							0.2300	(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) =	0.1783	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1872	0.1783	0.1783	0.1649	0.1649	0.1471	0.1515	0.1426	0.1471	0.1560	0.1560	0.1693 (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

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	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	0.9918	0.9889	0.9774	0.9371	0.8143	0.5707	0.3817	0.4157	0.7433	0.9436	0.9845	0.9931	(86)	
MIT	20.1100	20.1859	20.3903	20.6589	20.8919	20.9874	20.9988	20.9982	20.9500	20.6957	20.3591	20.0849	(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	0.9891	0.9851	0.9694	0.9137	0.7512	0.4667	0.2626	0.2906	0.6461	0.9173	0.9784	0.9907	(89)	
MIT 2	19.2336	19.3086	19.5095	19.7648	19.9627	20.0224	20.0262	20.0261	20.0048	19.8030	19.4804	19.2089	(90)	
Living area fraction	19.5473	19.6226	19.8248	20.0848	20.2953	20.3678	20.3744	20.3741	20.3432	20.1225	19.7950	19.5225	(91)	
MIT	19.3973	19.4726	19.6748	19.9348	20.1453	20.2178	20.2244	20.2241	20.1932	19.9725	19.6450	19.3725	(92)	
Temperature adjustment													-0.1500	
adjusted MIT	19.3973	19.4726	19.6748	19.9348	20.1453	20.2178	20.2244	20.2241	20.1932	19.9725	19.6450	19.3725	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9868	0.9824	0.9657	0.9111	0.7598	0.4878	0.2870	0.3162	0.6642	0.9155	0.9753	0.9887	(94)		
Useful gains	540.7219	558.3384	570.7152	571.6654	491.0164	316.1029	176.1305	183.5819	359.8601	471.9296	504.1687	522.4738	(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															
Month fracti	1084.3904	1052.1803	930.9881	761.0977	541.9386	319.9041	176.2932	183.8555	378.7099	635.0214	883.2211	1082.5048	(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	404.4893	331.8618	268.0431	136.3913	37.8861	0.0000	0.0000	0.0000	0.0000	121.3403	272.9177	416.6631	(98)		
Space heating													1989.5927	(98)	
Space heating per m2													(98) / (4) =	28.0382	(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													2198.4449 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.4893	331.8618	268.0431	136.3913	37.8861	0.0000	0.0000	0.0000	0.0000	121.3403	272.9177	416.6631	(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)	446.9496	366.6981	296.1802	150.7086	41.8631	0.0000	0.0000	0.0000	0.0000	134.0777	301.5666	460.4012	(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	89.5785	89.5342	89.3567	88.9307	88.0355	87.3000	87.3000	87.3000	87.3000	88.8075	89.3800	87.3000	(216)
Fuel for water heating, kWh/month	176.1527	154.5685	160.8515	142.3790	139.1110	122.6961	115.3229	130.0199	130.8860	147.9771	158.6001	171.0063	(219)
Water heating fuel used												1749.5711	(219)
Annual totals kWh/year													
Space heating fuel - main system												2198.4449	(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													4428.5676 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2198.4449	3.6300	79.8036 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1749.5711	3.6300	63.5094 (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			331.7322 (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	2198.4449	0.2160	474.8641 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1749.5711	0.2160	377.9074 (264)
Space and water heating			852.7715 (265)
Pumps and fans	113.2298	0.5190	58.7663 (267)
Energy for lighting	367.3218	0.5190	190.6400 (268)
Total kg/year			1102.1777 (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	2198.4449	1.2200	2682.1028 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1749.5711	1.2200	2134.4768 (264)
Space and water heating			4816.5796 (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			6291.8730 (272)
Primary energy kWh/m2/year			88.6679 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 86

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 86

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	£238	£238	£0
Space heating	£197	£197	£0
Water heating	£64	£64	£0
Lighting	£71	£71	£0
Total cost of fuels	£331	£331	£0
Total cost of uses	£332	£332	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	89 kWh/m²	89 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	47.75 (37)
Summer heat loss coefficient	384.95 (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:				267.4160

Solar gains	Jun	Jul	Aug	
Internal gains	289	267	219	(P4)
Total summer gains	398	382	390	
	687	649	609	(P5)
Summer gain/loss ratio	1.78	1.69	1.58	(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	18.03	19.84	19.63	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			