

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025u_074_As_Built				Issued on Date	11/01/2022
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	83 B	DER	19.33	TER	20.91	
Environmental	88 B	% DER<TER	7.56			
CO ₂ Emissions (t/year)	0.86	DFEE	47.69	TFEE	55.06	
General Requirements Compliance	Pass	% DFEE<TFEE	13.38			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 54 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) 20.91 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.33 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 47.7 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.29 (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	1.24 (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: 3.98 (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: 1.44 m², No overhang
Windows facing East: 6.42 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 4.0 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (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					3.9800
Infiltration rate					0.1990 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1692 (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	0.2157	0.2114	0.2072	0.1861	0.1818	0.1607	0.1607	0.1565	0.1692	0.1818	0.1903	0.1988 (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)			7.8600	1.2357	9.7129		(27)
FT-03			53.7000	0.1247	6.6938		(28b)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m2)			104.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.1406		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Ceilings 1			53.7000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.1554 (36)
Total fabric heat loss							(33) + (36) = 40.2960 (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	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Average = Sum(39)m / 12 =	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy content (annual)	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (46)
	Total = Sum(45)m =										1210.4159 (45)	

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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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	(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	(63)
Output from w/h	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	(64)
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	(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	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	285.4661	283.6496	273.3859	257.0218	240.6859	224.7877	214.3778	219.4146	227.7589	244.2987	263.2452	277.1869	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					1.4400	10.6334	0.4500	0.0000			0.7700	5.3056 (74)
East					6.4200	19.6403	0.4500	0.0000			0.7700	43.6904 (76)
Solar gains	48.9960	95.6069	157.9822	232.9544	288.8583	297.4445	282.4444	240.1708	184.4166	113.4841	61.0219	40.3519 (83)
Total gains	334.4621	379.2565	431.3681	489.9762	529.5442	522.2322	496.8223	459.5854	412.1756	357.7828	324.2671	317.5388 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	
alpha	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	
util living area	0.9976	0.9951	0.9866	0.9549	0.8652	0.6997	0.5332	0.5944	0.8467	0.9758	0.9953	0.9982	(86)
MIT	19.7848	19.9259	20.1826	20.5152	20.7998	20.9499	20.9896	20.9825	20.8674	20.4905	20.0673	19.7448	(87)
Th 2	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	(88)
util rest of house	0.9968	0.9934	0.9818	0.9381	0.8172	0.6076	0.4138	0.4712	0.7745	0.9636	0.9934	0.9976	(89)
MIT 2	18.8591	18.9997	19.2538	19.5757	19.8302	19.9406	19.9605	19.9582	19.8902	19.5578	19.1411	18.8192	(90)
Living area fraction	19.1367	19.2774	19.5323	19.8574	20.1209	20.2432	20.2691	20.2653	20.1831	19.8374	19.4188	19.0967	(91)
MIT	18.9867	19.1274	19.3823	19.7074	19.9709	20.0932	20.1191	20.1153	20.0331	19.6874	19.2688	18.9467	(92)
Temperature adjustment												-0.1500	
adjusted MIT													(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9958	0.9916	0.9782	0.9330	0.8176	0.6200	0.4323	0.4901	0.7802	0.9594	0.9916	0.9967	(94)
Useful gains	333.0534	376.0663	421.9800	457.1530	432.9567	323.7811	214.7600	225.2538	321.5898	343.2413	321.5436	316.4987	(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	904.1282	875.8541	793.0503	665.3149	509.1677	338.1700	216.6380	228.7196	365.2516	559.4324	749.1234	907.8264	(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	424.8796	335.8574	276.0763	149.8766	56.7010	0.0000	0.0000	0.0000	0.0000	160.8461	307.8575	439.9478	(98)
Space heating												2152.0423	(98)
Space heating per m2												40.0753	(99)
										(98) / (4) =			

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2377.9473 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.8796	335.8574	276.0763	149.8766	56.7010	0.0000	0.0000	0.0000	0.0000	160.8461	307.8575	439.9478	(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)	469.4802	371.1131	305.0567	165.6095	62.6531	0.0000	0.0000	0.0000	0.0000	177.7305	340.1740	486.1301	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Efficiency of water heater (217)m	89.6874	89.6226	89.4655	89.1015	88.3714	87.3000	87.3000	87.3000	87.3000	89.1278	89.5497	89.7254	(216)
Fuel for water heating, kWh/month	155.5466	136.5707	142.2117	125.9628	122.9668	109.0580	102.6852	115.5156	116.2062	130.6856	140.0884	151.0585	(219)
Water heating fuel used												1548.5561	(219)
Annual totals kWh/year													
Space heating fuel - main system												2377.9473	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.9310 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.9310 (231)
Electricity for lighting (calculated in Appendix L)													262.3699 (232)
Total delivered energy for all uses													4292.8044 (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	2377.9473	0.2160	513.6366	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1548.5561	0.2160	334.4881	(264)
Space and water heating			848.1247	(265)
Pumps and fans	103.9310	0.5190	53.9402	(267)
Energy for lighting	262.3699	0.5190	136.1700	(268)
Total CO2, kg/year			1038.2349	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.3300	(273)

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

DER		19.3300	ZC1
Total Floor Area	TFA	53.7000	
Assumed number of occupants	N	1.7992	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3061	ZC2
CO2 emissions from cooking, equation (L16)		3.0201	ZC3
Total CO2 emissions		39.6562	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		39.6562	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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1552 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4052 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3444 (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	0.4391	0.4305	0.4219	0.3788	0.3702	0.3272	0.3272	0.3186	0.3444	0.3702	0.3875	0.4047 (22b)
Effective ac	0.5964	0.5927	0.5890	0.5718	0.5685	0.5535	0.5535	0.5507	0.5593	0.5685	0.5751	0.5819 (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)			7.8600	1.3258	10.4205		(27)
FT-03			53.7000	0.1300	6.9810		(28b)
WT-E-01	43.5600	7.8600	35.7000	0.1800	6.4260		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.1800	0.9180		(29a)
Total net area of external elements Aum(A, m ²)			104.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.8655		(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)							11.9299 (36)
Total fabric heat loss						(33) + (36) =	38.7954 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.3656	25.2064	25.0503	24.3173	24.1801	23.5416	23.5416	23.4234	23.7876	24.1801	24.4576	24.7477 (38)
Heat transfer coeff	64.1610	64.0018	63.8457	63.1126	62.9755	62.3370	62.3370	62.2188	62.5829	62.9755	63.2529	63.5430 (39)
Average = Sum(39)m / 12 =												63.1120 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1948	1.1918	1.1889	1.1753	1.1727	1.1608	1.1608	1.1586	1.1654	1.1727	1.1779	1.1833 (40)
HLP (average)												1.1753 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)										Total = Sum(45)m =		1210.4159 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	43.1232	37.5336	39.9870	37.1796	36.8508	34.1445	35.2826	36.8508	37.1796	39.9870	40.2146	43.1232 (61)
Total heat required for water heating calculated for each month	168.6175	147.2917	153.2475	135.9228	131.5972	115.9035	111.0444	123.7885	125.1556	142.5146	152.1315	164.6577 (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	168.6175	147.2917	153.2475	135.9228	131.5972	115.9035	111.0444	123.7885	125.1556	142.5146	152.1315	164.6577 (64)
Heat gains from water heating, kWh/month	52.5076	45.8780	47.6559	42.1270	40.7159	35.7210	34.0114	38.1195	38.5469	44.0872	47.2660	51.1910 (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	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959 (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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671 (71)
Water heating gains (Table 5)	70.5748	68.2708	64.0536	58.5097	54.7257	49.6125	45.7143	51.2359	53.5374	59.2569	65.6472	68.8051 (72)
Total internal gains	295.2483	292.9106	282.1282	265.2468	248.3908	231.9738	221.5688	227.1240	235.9907	253.0478	272.5101	286.9718 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					1.4400	10.6334	0.6300	0.7000			0.7700	4.6796 (74)
East					6.4200	19.6403	0.6300	0.7000			0.7700	38.5349 (76)
Solar gains	43.2145	84.3253	139.3403	205.4658	254.7730	262.3460	249.1160	211.8307	162.6555	100.0930	53.8213	35.5903 (83)
Total gains	338.4627	377.2359	421.4685	470.7126	503.1638	494.3198	470.6848	438.9547	398.6462	353.1407	326.3314	322.5621 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.1220	58.2666	58.4091	59.0875	59.2162	59.8227	59.8227	59.9364	59.5876	59.2162	58.9564	58.6873
alpha	4.8748	4.8844	4.8939	4.9392	4.9477	4.9882	4.9882	4.9958	4.9725	4.9477	4.9304	4.9125
util living area	0.9975	0.9953	0.9883	0.9627	0.8882	0.7331	0.5656	0.6230	0.8640	0.9777	0.9952	0.9980 (86)
MIT	19.7269	19.8632	20.1157	20.4595	20.7584	20.9362	20.9859	20.9778	20.8476	20.4607	20.0352	19.7039 (87)
Th 2	19.9242	19.9265	19.9289	19.9398	19.9419	19.9515	19.9515	19.9532	19.9478	19.9419	19.9377	19.9334 (88)
util rest of house	0.9967	0.9937	0.9840	0.9482	0.8445	0.6408	0.4395	0.4954	0.7951	0.9664	0.9933	0.9974 (89)
MIT 2	18.2342	18.4346	18.8030	19.3013	19.7018	19.9084	19.9463	19.9440	19.8226	19.3117	18.6943	18.2071 (90)
Living area fraction									fLA = Living area / (4) =			0.2998 (91)
MIT	18.6817	18.8629	19.1966	19.6485	20.0186	20.2165	20.2580	20.2539	20.1299	19.6562	19.0963	18.6558 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6817	18.8629	19.1966	19.6485	20.0186	20.2165	20.2580	20.2539	20.1299	19.6562	19.0963	18.6558 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9914	0.9800	0.9432	0.8482	0.6659	0.4776	0.5338	0.8089	0.9623	0.9910	0.9962 (94)
Useful gains	336.8449	373.9875	413.0502	443.9598	426.7758	329.1839	224.8205	234.3343	322.4776	339.8199	323.4103	321.3349 (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	922.7472	893.6521	810.6214	678.3685	523.8669	350.1177	228.0264	239.7853	377.3672	570.3168	758.8043	918.5675 (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	435.9113	349.2146	295.7930	168.7743	72.2357	0.0000	0.0000	0.0000	0.0000	171.4897	313.4837	444.3411 (98)
Space heating												2251.2434 (98)
Space heating per m2										(98) / (4) =		41.9226 (99)

8c. Space cooling requirement

Not applicable

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

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Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.4000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2410.3249	(211)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Space heating requirement	435.9113 349.2146 295.7930 168.7743 72.2357 0.0000 0.0000 0.0000 0.0000 171.4897 313.4837 444.3411	(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)	466.7145 373.8915 316.6948 180.7005 77.3402 0.0000 0.0000 0.0000 0.0000 183.6078 335.6357 475.7399	(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	168.6175 147.2917 153.2475 135.9228 131.5972 115.9035 111.0444 123.7885 125.1556 142.5146 152.1315 164.6577	(64)
Efficiency of water heater	87.3360 87.1482 86.6793 85.5973 83.6105 80.3000 80.3000 80.3000 80.3000 85.5181 86.8316 87.4269	(216)
Fuel for water heating, kWh/month	193.0675 169.0128 176.7983 158.7934 157.3932 144.3381 138.2869 154.1575 155.8600 166.6484 175.2029 188.3377	(219)
Water heating fuel used		1977.8967 (219)
Annual totals kWh/year		
Space heating fuel - main system		2410.3249 (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)		262.3699 (232)
Total delivered energy for all uses		4725.5915 (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	2410.3249	0.2160	520.6302 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1977.8967	0.2160	427.2257 (264)
Space and water heating			947.8559 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	262.3699	0.5190	136.1700 (268)
Total CO2, kg/m2/year			1122.9509 (272)
Emissions per m2 for space and water heating			17.6509 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5358 (272b)
Emissions per m2 for pumps and fans			0.7249 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6509 * 1.00) + 2.5358 + 0.7249, rounded to 2 d.p.			20.9100 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1552 (8)
Pressure test				Yes	
Measured/design AP50				3.9800	
Infiltration rate				0.3542 (18)	
Number of sides sheltered				2 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3011 (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	0.3838	0.3763	0.3688	0.3312	0.3236	0.2860	0.2860	0.2785	0.3011	0.3236	0.3387	0.3537 (22b)
Effective ac	0.5737	0.5708	0.5680	0.5548	0.5524	0.5409	0.5409	0.5388	0.5453	0.5524	0.5574	0.5626 (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)			7.8600	1.2357	9.7129		(27)
FT-03			53.7000	0.1247	6.6938		(28b)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum (m ²)			104.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					27.1406		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Ceilings 1			53.7000				(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)							13.1554 (36)
Total fabric heat loss						(33) + (36) =	40.2960 (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	24.3984	24.2767	24.1574	23.5973	23.4925	23.0046	23.0046	22.9143	23.1926	23.4925	23.7045	23.9262 (38)
Heat transfer coeff	64.6944	64.5727	64.4535	63.8933	63.7885	63.3007	63.3007	63.2103	63.4886	63.7885	64.0005	64.2222 (39)
Average = Sum(39)m / 12 =												63.8928 (39)
HLP	1.2047	1.2025	1.2003	1.1898	1.1879	1.1788	1.1788	1.1771	1.1823	1.1879	1.1918	1.1959 (40)
HLP (average)												1.1898 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)										Total = Sum(45)m =		1210.4159 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	26.6675	23.3236	24.0679	20.9829	20.1336	17.3738	16.0994	18.4743	18.6949	21.7871	23.7823	25.8261 (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	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	35.8434	34.7077	32.3493	29.1430	27.0613	24.1303	21.6389	24.8310	25.9651	29.2837	33.0310	34.7125	(72)
Total internal gains	257.5169	256.3475	247.4239	232.8801	217.7264	203.4916	194.4934	197.7192	205.4185	220.0746	236.8938	249.8791	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			1.4400		10.6334		0.4500		0.0000		0.7700		5.3056 (74)
East			6.4200		19.6403		0.4500		0.0000		0.7700		43.6904 (76)

Solar gains	48.9960	95.6069	157.9822	232.9544	288.8583	297.4445	282.4444	240.1708	184.4166	113.4841	61.0219		40.3519 (83)
Total gains	306.5129	351.9545	405.4061	465.8344	506.5847	500.9360	476.9378	437.8900	389.8351	333.5587	297.9158		290.2310 (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	57.6428	57.7514	57.8583	58.3655	58.4614	58.9120	58.9120	58.9962	58.7376	58.4614	58.2677	58.0666	
alpha	4.8429	4.8501	4.8572	4.8910	4.8974	4.9275	4.9275	4.9331	4.9158	4.8974	4.8845	4.8711	
util living area	0.9984	0.9965	0.9901	0.9649	0.8888	0.7328	0.5661	0.6316	0.8755	0.9826	0.9968	0.9988	(86)
MIT	19.6591	19.8066	20.0760	20.4381	20.7516	20.9338	20.9852	20.9753	20.8318	20.4170	19.9714	19.6315	(87)
Th 2	19.9162	19.9180	19.9198	19.9282	19.9297	19.9370	19.9370	19.9384	19.9342	19.9297	19.9266	19.9232	(88)
util rest of house	0.9978	0.9953	0.9864	0.9509	0.8449	0.6395	0.4384	0.5015	0.8090	0.9733	0.9955	0.9984	(89)
MIT 2	18.6964	18.8449	19.1139	19.4739	19.7613	19.9066	19.9333	19.9313	19.8385	19.4599	19.0165	18.6744	(90)
Living area fraction									fLA = Living area / (4) =			0.2998	(91)
MIT	18.9850	19.1333	19.4023	19.7629	20.0582	20.2146	20.2486	20.2443	20.1363	19.7469	19.3028	18.9614	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9850	19.1333	19.4023	19.7629	20.0582	20.2146	20.2486	20.2443	20.1363	19.7469	19.3028	18.9614	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9972	0.9941	0.9841	0.9483	0.8509	0.6658	0.4772	0.5410	0.8238	0.9712	0.9944	0.9978	(94)
Ext temp.	305.6447	349.8817	398.9715	441.7466	431.0717	333.5146	227.5721	236.8936	321.1433	323.9649	296.2464	289.5995	(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	950.0380	919.0798	831.5996	694.0693	533.1582	355.4064	230.9617	242.9994	383.2377	583.4655	780.9833	948.0075	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	479.4286	382.5012	321.8753	181.6724	75.9524	0.0000	0.0000	0.0000	0.0000	193.0684	349.0105	489.8555	(98)
												2473.3644	(98)
												46.0589	(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	595.0262	468.4249	480.3984	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8678	0.9259	0.8992	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	516.3724	433.7010	431.9627	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	653.6307	624.3112	579.8163	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	98.8260	141.8140	110.0030	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												350.6430	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.7065	35.4535	27.5008	0.0000	0.0000	0.0000 (107)
Space cooling											87.6607 (107)
Space cooling per m2											1.6324 (108)
Energy for space heating											46.0589 (99)
Energy for space cooling											1.6324 (108)
Total											47.6913 (109)
Dwelling Fabric Energy Efficiency (DFEE)											47.7 (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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1552 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4052 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3444 (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	0.4391	0.4305	0.4219	0.3788	0.3702	0.3272	0.3272	0.3186	0.3444	0.3702	0.3875	0.4047 (22b)
	0.5964	0.5927	0.5890	0.5718	0.5685	0.5535	0.5535	0.5507	0.5593	0.5685	0.5751	0.5819 (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)			7.8600	1.3258	10.4205		(27)
FT-03			53.7000	0.1300	6.9810		(28b)
WT-E-01	43.5600	7.8600	35.7000	0.1800	6.4260		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.1800	0.9180		(29a)
Total net area of external elements Aum(A, m ²)			104.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.8655		(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)							11.9299 (36)
Total fabric heat loss						(33) + (36) =	38.7954 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.3656	25.2064	25.0503	24.3173	24.1801	23.5416	23.5416	23.4234	23.7876	24.1801	24.4576	24.7477 (38)
Heat transfer coeff	64.1610	64.0018	63.8457	63.1126	62.9755	62.3370	62.3370	62.2188	62.5829	62.9755	63.2529	63.5430 (39)
Average = Sum(39)m / 12 =												63.1120 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1948	1.1918	1.1889	1.1753	1.1727	1.1608	1.1608	1.1586	1.1654	1.1727	1.1779	1.1833 (40)
HLP (average)												1.1753 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)										Total = Sum(45)m =		1210.4159 (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	0.0000 (59)
Heat gains from water heating, kWh/month	26.6675	23.3236	24.0679	20.9829	20.1336	17.3738	16.0994	18.4743	18.6949	21.7871	23.7823	25.8261 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589	89.9589 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8565	13.1954	10.7312	8.1242	6.0729	5.1270	5.5399	7.2010	9.6652	12.2722	14.3235	15.2694 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8293	158.4567	154.3557	145.6252	134.6045	124.2466	117.3269	115.6995	119.8004	128.5310	139.5517	149.9096 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959	31.9959 (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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671 (71)
Water heating gains (Table 5)	35.8434	34.7077	32.3493	29.1430	27.0613	24.1303	21.6389	24.8310	25.9651	29.2837	33.0310	34.7125 (72)
Total internal gains	257.5169	256.3475	247.4239	232.8801	217.7264	203.4916	194.4934	197.7192	205.4185	220.0746	236.8938	249.8791 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North						1.4400	10.6334	0.6300	0.7000	0.7700	4.6796 (74)	
East						6.4200	19.6403	0.6300	0.7000	0.7700	38.5349 (76)	

Solar gains	43.2145	84.3253	139.3403	205.4658	254.7730	262.3460	249.1160	211.8307	162.6555	100.0930	53.8213	35.5903 (83)
Total gains	300.7314	340.6728	386.7642	438.3458	472.4994	465.8376	443.6094	409.5498	368.0739	320.1675	290.7152	285.4695 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	58.1220	58.2666	58.4091	59.0875	59.2162	59.8227	59.8227	59.9364	59.5876	59.2162	58.9564	58.6873
alpha	4.8748	4.8844	4.8939	4.9392	4.9477	4.9882	4.9882	4.9958	4.9725	4.9477	4.9304	4.9125
util living area	0.9985	0.9970	0.9918	0.9715	0.9074	0.7626	0.5956	0.6591	0.8915	0.9850	0.9971	0.9989 (86)
MIT	19.6622	19.8010	20.0585	20.4119	20.7267	20.9237	20.9824	20.9716	20.8192	20.4085	19.9745	19.6400 (87)
Th 2	19.9242	19.9265	19.9289	19.9398	19.9419	19.9515	19.9515	19.9532	19.9478	19.9419	19.9377	19.9334 (88)
util rest of house	0.9980	0.9959	0.9887	0.9598	0.8684	0.6717	0.4651	0.5281	0.8302	0.9769	0.9959	0.9985 (89)
MIT 2	18.7058	18.8462	19.1040	19.4593	19.7525	19.9153	19.9469	19.9449	19.8424	19.4620	19.0286	18.6910 (90)
Living area fraction									fLA = Living area / (4) =			0.2998 (91)
MIT	18.9925	19.1325	19.3902	19.7449	20.0446	20.2176	20.2574	20.2527	20.1353	19.7458	19.3122	18.9755 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9925	19.1325	19.3902	19.7449	20.0446	20.2176	20.2574	20.2527	20.1353	19.7458	19.3122	18.9755 (93)

8. Space heating requirement

Utilisation	0.9974	0.9949	0.9867	0.9572	0.8728	0.6968	0.5047	0.5679	0.8431	0.9749	0.9949	0.9980 (94)
Useful gains	299.9497	338.9192	381.6129	419.5667	412.4084	324.6148	223.9080	232.5779	310.3345	312.1407	289.2455	284.8960 (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	942.6876	910.9026	822.9838	684.4514	525.5046	350.1864	227.9886	239.7090	377.7042	575.9598	772.4559	938.8788 (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	478.1970	384.3728	328.3800	190.7170	84.1435	0.0000	0.0000	0.0000	0.0000	196.2814	347.9115	486.5632 (98)
Space heating												2496.5664 (98)
Alpha heating per m2										(98) / (4) =		46.4910 (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	585.9678	461.2938	472.8626	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8510	0.9150	0.8874	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	498.6350	422.0738	419.6174	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	612.6065	585.3558	546.6914	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	82.0595	121.4818	94.5430	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												298.0844 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
												fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	20.5149	30.3705	23.6358	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													74.5211 (107)
Energy for space heating													1.3877 (108)
Energy for space cooling													46.4910 (99)
Total													1.3877 (108)
Target Fabric Energy Efficiency (TFEE)													47.8787 (109)
													55.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.9800
Number of sides sheltered					0.1990 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1692 (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	0.1776	0.1692	0.1692	0.1565	0.1565	0.1395	0.1438	0.1353	0.1395	0.1480	0.1480	0.1607 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			7.8600	1.2357	9.7129		(27)
FT-03			53.7000	0.1247	6.6938		(28b)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m ²)			104.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.1406	(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Ceilings 1			53.7000				(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)							13.1554 (36)
Total fabric heat loss						(33) + (36) =	40.2960 (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	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Average = Sum(39)m / 12 =	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy content (annual)	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (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	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	14.0034	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	43.9111	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.1412	32.9885	26.8280	20.3105	15.1824	12.8176	13.8499	18.0026	24.1630	30.6805	35.8087	38.1734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.0736	236.5026	230.3817	217.3511	200.9022	185.4427	175.1147	172.6858	178.8066	191.8373	208.2861	223.7457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	418.5852	415.0786	399.0988	374.5241	349.6832	327.2645	314.0658	320.7925	334.8530	359.6034	387.0550	407.5172	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					1.4400	11.9814	0.4500	0.0000	0.7700	5.9783 (74)		
East					6.4200	22.3313	0.4500	0.0000	0.7700	49.6767 (76)		
Solar gains	55.6549	97.7852	159.5325	241.9742	291.8016	321.3054	301.9062	262.9046	201.7295	123.9279	71.0307	45.3787 (83)
Total gains	474.2401	512.8638	558.6313	616.4983	641.4848	648.5699	615.9719	583.6972	536.5826	483.5313	458.0857	452.8959 (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	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	
Feb	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	
Mar	0.9864	0.9787	0.9525	0.8742	0.7087	0.4687	0.3092	0.3366	0.6342	0.8995	0.9734	0.9888	0.9888	(86)
Apr	20.1057	20.2193	20.4660	20.7473	20.9337	20.9933	20.9994	20.9990	20.9706	20.7485	20.3798	20.0707	20.0707	(87)
May	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	(88)
Jun	0.9821	0.9720	0.9373	0.8364	0.6363	0.3745	0.2061	0.2280	0.5343	0.8594	0.9634	0.9852	0.9852	(89)
Jul	19.1769	19.2881	19.5260	19.7814	19.9273	19.9612	19.9631	19.9630	19.9517	19.7894	19.4466	19.1427	19.1427	(90)
Aug	19.4554	19.5673	19.8078	20.0710	20.2291	20.2706	20.2738	20.2736	20.2572	20.0769	19.7264	19.4209	19.4209	(91)
Sep	19.3054	19.4173	19.6578	19.9210	20.0791	20.1206	20.1238	20.1236	20.1072	19.9269	19.5764	19.2709	19.2709	(92)
Oct														(93)
Nov														
Dec														

8. Space heating requirement

Utilisation	0.9785	0.9674	0.9318	0.8347	0.6450	0.3890	0.2222	0.2449	0.5489	0.8578	0.9586	0.9820	0.9820	(94)
Useful gains	464.0429	496.1630	520.5480	514.5717	413.7370	252.3027	136.8431	142.9553	294.5558	414.7600	439.1166	444.7320	444.7320	(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	5.1000	(96)
Heat loss rate W	874.5009	850.6081	754.6056	616.9038	435.7957	253.6711	136.8976	143.0457	302.0948	512.6157	712.6547	872.3801	872.3801	(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	1.0000	(97a)
Space heating kWh	305.3808	238.1871	174.1388	73.6791	16.4117	0.0000	0.0000	0.0000	0.0000	72.8046	196.9474	318.1702	318.1702	(98)
Space heating														(98)
RHI space heating demand														(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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.9800
Number of sides sheltered					0.1990 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1692 (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	0.2157	0.2114	0.2072	0.1861	0.1818	0.1607	0.1607	0.1565	0.1692	0.1818	0.1903	0.1988 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			7.8600	1.2357	9.7129		(27)
FT-03			53.7000	0.1247	6.6938		(28b)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m ²)			104.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.1406		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Ceilings 1			53.7000				(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)							13.1554 (36)
Total fabric heat loss						(33) + (36) =	40.2960 (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	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Average = Sum(39)m / 12 =	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy content (annual)	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (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	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	14.0034	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	43.9111	(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	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.1412	32.9885	26.8280	20.3105	15.1824	12.8176	13.8499	18.0026	24.1630	30.6805	35.8087	38.1734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.0736	236.5026	230.3817	217.3511	200.9022	185.4427	175.1147	172.6858	178.8066	191.8373	208.2861	223.7457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	418.5852	415.0786	399.0988	374.5241	349.6832	327.2645	314.0658	320.7925	334.8530	359.6034	387.0550	407.5172	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					1.4400	10.6334	0.4500	0.0000			0.7700	5.3056 (74)
East					6.4200	19.6403	0.4500	0.0000			0.7700	43.6904 (76)

Solar gains	48.9960	95.6069	157.9822	232.9544	288.8583	297.4445	282.4444	240.1708	184.4166	113.4841	61.0219	40.3519 (83)
Total gains	467.5812	510.6856	557.0810	607.4785	638.5415	624.7090	596.5102	560.9634	519.2697	473.0875	448.0769	447.8690 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	
alpha	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	
util living area	0.9896	0.9825	0.9629	0.9068	0.7858	0.6063	0.4494	0.4967	0.7410	0.9323	0.9813	0.9916	(86)
MIT	20.0106	20.1436	20.3766	20.6604	20.8762	20.9734	20.9951	20.9920	20.9300	20.6514	20.2720	19.9672	(87)
Th 2	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	(88)
util rest of house	0.9864	0.9771	0.9513	0.8782	0.7276	0.5183	0.3460	0.3889	0.6569	0.9049	0.9745	0.9890	(89)
MIT 2	19.0828	19.2136	19.4401	19.7049	19.8860	19.9519	19.9620	19.9611	19.9285	19.7036	19.3415	19.0400	(90)
Living area fraction	19.3610	19.4924	19.7209	19.9914	20.1829	20.2582	20.2717	20.2702	20.2287	19.9877	19.6205	19.3180	(91)
MIT	19.3610	19.4924	19.7209	19.9914	20.1829	20.2582	20.2717	20.2702	20.2287	19.9877	19.6205	19.3180	(92)
Temperature adjustment	19.2110	19.3424	19.5709	19.8414	20.0329	20.1082	20.1217	20.1202	20.0787	19.8377	19.4705	19.1680	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	459.7826	496.8980	526.9283	531.1290	467.3444	331.7720	215.9581	227.5259	346.4291	426.1911	434.7934	441.7168	(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	917.9382	889.0921	804.6585	673.5629	512.9812	339.0901	216.8018	229.0175	368.0584	568.6866	761.5420	921.4490	(97)
Month fracti	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 kWh	340.8677	263.5544	206.6313	102.5524	33.9538	0.0000	0.0000	0.0000	0.0000	106.0167	235.2590	356.9208	(98)
Space heating												1645.7561	(98)
Space heating per m ²												30.6472	(99)

8c. Space cooling requirement

Not applicable

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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													1818.5150 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	340.8677	263.5544	206.6313	102.5524	33.9538	0.0000	0.0000	0.0000	0.0000	106.0167	235.2590	356.9208	(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)	376.6494	291.2203	228.3218	113.3175	37.5180	0.0000	0.0000	0.0000	0.0000	117.1455	259.9547	394.3876	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Efficiency of water heater (217)m	89.5468	89.4601	89.2532	88.7992	88.0411	87.3000	87.3000	87.3000	87.3000	88.7961	89.3608	89.5961	(216)
Fuel for water heating, kWh/month	155.7909	136.8188	142.5498	126.3916	123.4281	109.0580	102.6852	115.5156	116.2062	131.1739	140.3845	151.2765	(219)
Water heating fuel used												1551.2791	(219)
Annual totals kWh/year													
Space heating fuel - main system												1818.5150	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													28.9310 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													103.9310 (231)
Electricity for lighting (calculated in Appendix L)													262.3699 (232)
Total delivered energy for all uses													3736.0950 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1818.5150	3.4800	63.2843 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1551.2791	3.4800	53.9845 (247)
Mechanical ventilation fans	28.9310	13.1900	3.8160 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	262.3699	13.1900	34.6066 (250)
Additional standing charges			120.0000 (251)
Total energy cost			285.5839 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.2153 (257)
SAP value		83.0473
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	1818.5150	0.2160	392.7992 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1551.2791	0.2160	335.0763 (264)
Space and water heating			727.8755 (265)
Pumps and fans	103.9310	0.5190	53.9402 (267)
Energy for lighting	262.3699	0.5190	136.1700 (268)
Total kg/year			917.9857 (272)
CO2 emissions per m2			17.0900 (273)
EI value			87.5370
EI rating			88 (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	$3.48 / 0.8850 = 3.932$, stars = 4
Water heating environmental impact	$0.216 / 0.8850 = 0.2441$, 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	53.7000 (1b)	x 2.4000 (2b)	= 128.8800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.8800 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys		0	+	0	+	0	=	0 * 40 =	0.0000 (6a)			
Number of open flues		0	+	0	+	0	=	0 * 20 =	0.0000 (6b)			
Number of intermittent fans								0 * 10 =	0.0000 (7a)			
Number of passive vents								0 * 10 =	0.0000 (7b)			
Number of flueless gas fires								0 * 40 =	0.0000 (7c)			
									Air changes per hour			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =							0.0000 / (5) =	0.0000 (8)			
Pressure test								Yes				
Measured/design AP50								3.9800				
Infiltration rate								0.1990	(18)			
Number of sides sheltered								2	(19)			
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.8500 (20)			
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.1692 (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												
	0.1776	0.1692	0.1692	0.1565	0.1565	0.1395	0.1438	0.1353	0.1395	0.1480	0.1480	0.1607 (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)			7.8600	1.2357	9.7129		(27)
FT-03			53.7000	0.1247	6.6938		(28b)
WT-E-01	43.5600	7.8600	35.7000	0.2000	7.1400		(29a)
WT-I-01	7.2200	2.1200	5.1000	0.2890	1.4739		(29a)
Total net area of external elements Aum(A, m2)			104.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	27.1406		(33)
Party Wall 1			21.3600	0.0000	0.0000		(32)
Party Ceilings 1			53.7000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.1554 (36)
Total fabric heat loss						(33) + (36) =	40.2960 (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	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652	21.2652 (38)
Heat transfer coeff	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612	61.5612 (39)
Average = Sum(39)m / 12 =												61.5612 (39)
HLP	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464	1.1464 (40)
HLP (average)												1.1464 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7992 (42)
Average daily hot water use (litres/day)												76.9305 (43)
Daily hot water use	84.6235	81.5463	78.4691	75.3919	72.3146	69.2374	69.2374	72.3146	75.3919	78.4691	81.5463	84.6235 (44)
Energy conte	125.4942	109.7581	113.2605	98.7432	94.7465	81.7590	75.7617	86.9377	87.9760	102.5276	111.9169	121.5345 (45)
Energy content (annual)												Total = Sum(45)m = 1210.4159 (45)
Distribution loss (46)m = 0.15 x (45)m	18.8241	16.4637	16.9891	14.8115	14.2120	12.2639	11.3643	13.0407	13.1964	15.3791	16.7875	18.2302 (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	14.0114	12.6401	13.9699	13.4915	13.9210	13.4487	13.8825	13.9074	13.4720	13.9496	13.5318	14.0034	(61)
Total heat required for water heating calculated for each month	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Heat gains from water heating, kWh/month	45.2297	39.6546	41.1516	36.2050	34.9835	30.5470	28.6614	32.3837	32.6200	37.5778	40.5953	43.9111	(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	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	107.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.1412	32.9885	26.8280	20.3105	15.1824	12.8176	13.8499	18.0026	24.1630	30.6805	35.8087	38.1734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.0736	236.5026	230.3817	217.3511	200.9022	185.4427	175.1147	172.6858	178.8066	191.8373	208.2861	223.7457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	47.5942	(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)	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	-71.9671	(71)
Water heating gains (Table 5)	60.7926	59.0098	55.3113	50.2847	47.0208	42.4264	38.5234	43.5264	45.3056	50.5078	56.3824	59.0202	(72)
Total internal gains	418.5852	415.0786	399.0988	374.5241	349.6832	327.2645	314.0658	320.7925	334.8530	359.6034	387.0550	407.5172	(73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North	1.4400				11.9814	0.4500	0.0000	0.7700		5.9783 (74)		
East	6.4200				22.3313	0.4500	0.0000	0.7700		49.6767 (76)		
Solar gains	55.6549	97.7852	159.5325	241.9742	291.8016	321.3054	301.9062	262.9046	201.7295	123.9279	71.0307	45.3787 (83)
Total gains	474.2401	512.8638	558.6313	616.4983	641.4848	648.5699	615.9719	583.6972	536.5826	483.5313	458.0857	452.8959 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766	60.5766		
alpha	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384	5.0384		
util living area	0.9864	0.9787	0.9525	0.8742	0.7087	0.4687	0.3092	0.3366	0.6342	0.8995	0.9734	0.9888	(86)	
MIT	20.1057	20.2193	20.4660	20.7473	20.9337	20.9933	20.9994	20.9990	20.9706	20.7485	20.3798	20.0707	(87)	
Th 2	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	19.9631	(88)	
util rest of house	0.9821	0.9720	0.9373	0.8364	0.6363	0.3745	0.2061	0.2280	0.5343	0.8594	0.9634	0.9852	(89)	
MIT 2	19.1769	19.2881	19.5260	19.7814	19.9273	19.9612	19.9631	19.9630	19.9517	19.7894	19.4466	19.1427	(90)	
Living area fraction	19.4554	19.5673	19.8078	20.0710	20.2291	20.2706	20.2738	20.2736	20.2572	20.0769	19.7264	19.4209	(92)	
Temperature adjustment	19.3054	19.4173	19.6578	19.9210	20.0791	20.1206	20.1238	20.1236	20.1072	19.9269	19.5764	19.2709	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	464.0429	496.1630	520.5480	514.5717	413.7370	252.3027	136.8431	142.9553	294.5558	414.7600	439.1166	444.7320	(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	874.5009	850.6081	754.6056	616.9038	435.7957	253.6711	136.8976	143.0457	302.0948	512.6157	712.6547	872.3801	(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	305.3808	238.1871	174.1388	73.6791	16.4117	0.0000	0.0000	0.0000	0.0000	72.8046	196.9474	318.1702	(98)
Space heating												1395.7197	(98)
Space heating per m ²												25.9911	(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													1542.2318 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	305.3808	238.1871	174.1388	73.6791	16.4117	0.0000	0.0000	0.0000	0.0000	72.8046	196.9474	318.1702	(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)	337.4373	263.1902	192.4186	81.4134	18.1344	0.0000	0.0000	0.0000	0.0000	80.4471	217.6215	351.5693	(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	139.5057	122.3982	127.2303	112.2347	108.6675	95.2077	89.6442	100.8452	101.4480	116.4772	125.4487	135.5379	(64)
Efficiency of water heater (217)m	89.4716	89.3878	89.1209	88.5407	87.7069	87.3000	87.3000	87.3000	87.3000	88.5037	89.2273	89.5197	(216)
Fuel for water heating, kWh/month	155.9217	136.9294	142.7616	126.7605	123.8984	109.0580	102.6852	115.5156	116.2062	131.6072	140.5945	151.4055	(219)
Water heating fuel used												1553.3440	(219)
Annual totals kWh/year													
Space heating fuel - main system												1542.2318	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)												28.9310	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												103.9310	(231)
Electricity for lighting (calculated in Appendix L)												262.3699	(232)
Total delivered energy for all uses												3461.8766	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1542.2318	3.7400	57.6795 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1553.3440	3.7400	58.0951 (247)
Mechanical ventilation fans	28.9310	19.1200	5.5316 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	262.3699	19.1200	50.1651 (250)
Additional standing charges			94.0000 (251)
Total energy cost			279.8113 (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	1542.2318	0.2160	333.1221 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1553.3440	0.2160	335.5223 (264)
Space and water heating			668.6444 (265)
Pumps and fans	103.9310	0.5190	53.9402 (267)
Energy for lighting	262.3699	0.5190	136.1700 (268)
Total kg/year			858.7545 (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	1542.2318	1.2200	1881.5228 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1553.3440	1.2200	1895.0796 (264)
Space and water heating			3776.6024 (265)
Pumps and fans	103.9310	3.0700	319.0681 (267)
Energy for lighting	262.3699	3.0700	805.4757 (268)
Primary energy kWh/year			4901.1462 (272)
Primary energy kWh/m2/year			91.2690 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 88

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 88

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	£70	£70	£0
Mains gas	£210	£210	£0
Space heating	£172	£172	£0
Water heating	£58	£58	£0
Lighting	£50	£50	£0
Total cost of fuels	£280	£280	£0
Total cost of uses	£280	£280	£0
Delivered energy	64 kWh/m²	64 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	91 kWh/m²	91 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

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

Overheating Calculation

Summer ventilation heat loss coefficient	255.18 (P1)
Transmission heat loss coefficient	40.30 (37)
Summer heat loss coefficient	295.48 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	1.4400	81.1852	0.4500	0.0000	0.9000	47.3472
East	6.4200	117.5071	0.4500	0.0000	0.9000	305.5301
total:						352.8773

Solar gains	Jun	Jul	Aug	
	376	353	307	(P4)
Internal gains	324	311	318	
Total summer gains	700	664	625	(P5)
Summer gain/loss ratio	2.37	2.25	2.12	(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	18.62	20.40	20.17	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			