

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026x_129_As_Built				Issued on Date	07/07/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	83 B	DER	19.24	TER	21.30	
Environmental	87 B	% DER<TER	9.67			
CO ₂ Emissions (t/year)	0.94	DFEE	46.13	TFEE	56.52	
General Requirements Compliance	Pass	% DFEE<TFEE	18.39			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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

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DWELLING AS BUILT

Mid-floor flat, total floor area 57 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.30 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.24 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.36 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.46 (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): Slight OK
Based on:
Overshading: Average
Windows facing North: 6.42 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.5 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	57.0500 (1b)	x 2.4000 (2b)	= 136.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.9200 (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					3.4600
Infiltration rate					0.1730 (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) =				0.1471 (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	0.1875	0.1838	0.1801	0.1618	0.1581	0.1397	0.1397	0.1360	0.1471	0.1581	0.1654	0.1728 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Opening Type 1			2.1200	1.0000	2.1200		(26)	
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)	
WT-E-03	39.0200	6.4200	32.6000	0.1600	5.2160		(29a)	
WT-I-02	17.0400	2.1200	14.9200	0.1584	2.3636		(29a)	
WT-I-11	7.6800		7.6800	0.3600	2.7648		(29a)	
Flat Roof	23.5800		23.5800	0.1500	3.5370		(30)	
Total net area of external elements Aum(A, m2)			87.3200				(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.9349	(33)	
Party Wall 1			14.6400	0.0000	0.0000		(32)	
Party Floor 1			57.0500				(32d)	
Party Ceilings 1			33.4700				(32b)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								14.8229 (36)
Total fabric heat loss								(33) + (36) = 38.7578 (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	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918 (38)
Heat transfer coeff	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496 (39)
Average = Sum(39)m / 12 =												61.3496 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754 (40)
HLP (average)												1.0754 (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												1.8971 (42)
Average daily hot water use (litres/day)												79.2566 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.1823	84.0120	80.8417	77.6715	74.5012	71.3310	71.3310	74.5012	77.6715	80.8417	84.0120	87.1823 (44)
Energy conte	129.2888	113.0768	116.6851	101.7289	97.6113	84.2312	78.0526	89.5664	90.6362	105.6277	115.3009	125.2093 (45)
Energy content (annual)												Total = Sum(45)m = 1247.0152 (45)

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Distribution loss (46)m = 0.15 x (45)m	19.3933	16.9615	17.5028	15.2593	14.6417	12.6347	11.7079	13.4350	13.5954	15.8442	17.2951	18.7814 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0271	12.6533	13.9830	13.5024	13.9311	13.4570	13.8902	13.9167	13.4818	13.9615	13.5453	14.0185 (61)
Total heat required for water heating calculated for each month	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (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	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (64)
Heat gains from water heating, kWh/month	46.4953	40.7614	42.2935	37.2005	35.9385	31.3711	29.4250	33.2600	33.5070	38.6116	41.7239	45.1367 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1411.3830 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6054	14.7488	11.9945	9.0806	6.7879	5.7306	6.1921	8.0487	10.8030	13.7169	16.0096	17.0669 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	165.4506	167.1675	162.8410	153.6306	142.0040	131.0767	123.7766	122.0597	126.3862	135.5966	147.2232	158.1505 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848 (71)
Water heating gains (Table 5)	62.4937	60.6568	56.8462	51.6673	48.3045	43.5710	39.5498	44.7043	46.5374	51.8973	57.9498	60.6676 (72)
Total internal gains	299.0065	297.0298	286.1385	268.8353	251.5532	234.8351	223.9753	229.2696	238.1834	255.6676	275.6394	290.3418 (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				6.4200	10.6334	0.4500	0.0000	0.7700		23.6543 (74)		

Solar gains	23.6543	45.2046	76.8136	123.3824	166.2074	177.9299	166.1203	131.7953	92.3549	53.8101	29.1806	19.7194 (83)
Total gains	322.6608	342.2344	362.9521	392.2177	417.7605	412.7650	390.0956	361.0649	330.5383	309.4777	304.8200	310.0612 (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	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310
alpha	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221
util living area	0.9701	0.9628	0.9465	0.9084	0.8330	0.7128	0.5871	0.6362	0.8143	0.9229	0.9601	0.9731 (86)
MIT	18.7126	18.8840	19.2447	19.7590	20.2846	20.6836	20.8685	20.8312	20.5044	19.8671	19.1994	18.6566 (87)
Th 2	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210 (88)
util rest of house	0.9656	0.9571	0.9378	0.8920	0.7998	0.6484	0.4869	0.5398	0.7648	0.9060	0.9530	0.9691 (89)
MIT 2	17.9221	18.0918	18.4486	18.9525	19.4541	19.8122	19.9570	19.9334	19.6660	19.0643	18.4066	17.8667 (90)
Living area fraction									fLA = Living area / (4) =			0.5180 (91)
MIT	18.3316	18.5021	18.8610	19.3702	19.8842	20.2636	20.4291	20.3985	20.1003	19.4801	18.8172	18.2759 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1816	18.3521	18.7110	19.2202	19.7342	20.1136	20.2791	20.2485	19.9503	19.3301	18.6672	18.1259 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9545	0.9446	0.9231	0.8758	0.7886	0.6551	0.5154	0.5642	0.7607	0.8910	0.9402	0.9587 (94)
Ext temp.	307.9903	323.2742	335.0448	343.4889	329.4444	270.3947	201.0421	203.7304	251.4367	275.7401	286.6067	297.2519 (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	851.6284	825.2832	749.1368	633.1413	492.8974	338.2541	225.7113	236.1008	358.9105	535.5896	709.6447	854.3457 (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	404.4668	337.3500	308.0844	208.5497	121.6090	0.0000	0.0000	0.0000	0.0000	193.3281	304.5874	414.4778 (98)
Space heating per m2												2292.4531 (98)
										(98) / (4) =		40.1832 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2533.0974 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.4668	337.3500	308.0844	208.5497	121.6090	0.0000	0.0000	0.0000	0.0000	193.3281	304.5874	414.4778	(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)	446.9246	372.7625	340.4248	230.4417	134.3746	0.0000	0.0000	0.0000	0.0000	213.6222	336.5606	457.9865	(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	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278	(64)
Efficiency of water heater (217)m	89.6403	89.6082	89.5227	89.3346	88.9403	87.3000	87.3000	87.3000	87.3000	89.2497	89.5245	87.3000	(216)
Fuel for water heating, kWh/month	159.8788	140.3109	145.9608	128.9885	125.4127	111.8994	105.3181	118.5374	119.2645	133.9939	143.9228	155.2609	(219)
Water heating fuel used												1588.7487	(219)
Annual totals kWh/year													
Space heating fuel - main system												2533.0974	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													30.7358 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													105.7358 (231)
Electricity for lighting (calculated in Appendix L)													293.2562 (232)
Total delivered energy for all uses													4520.8380 (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	2533.0974	0.2160	547.1490 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1588.7487	0.2160	343.1697 (264)
Space and water heating			890.3187 (265)
Pumps and fans	105.7358	0.5190	54.8769 (267)
Energy for lighting	293.2562	0.5190	152.2000 (268)
Total CO2, kg/year			1097.3956 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.2400 (273)

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

DER		19.2400 ZC1
Total Floor Area	TFA	57.0500
Assumed number of occupants	N	1.8971
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.1854 ZC2
CO2 emissions from cooking, equation (L16)		2.8840 ZC3
Total CO2 emissions		39.3093 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		39.3093 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	57.0500 (1b)	x 2.4000 (2b)	= 136.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.9200 (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	0	0	2 * 10 =	20.0000 (7a)
Number of passive vents	0	0	0	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0	0	0	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1461 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3961 (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) =				0.3367 (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	0.4292	0.4208	0.4124	0.3703	0.3619	0.3198	0.3198	0.3114	0.3367	0.3619	0.3787	0.3956 (22b)
Effective ac	0.5921	0.5885	0.5850	0.5686	0.5655	0.5511	0.5511	0.5485	0.5567	0.5655	0.5717	0.5782 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200			(26)				
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114			(27)				
WT-E-03	39.0200	6.4200	32.6000	0.1800	5.8680			(29a)				
WT-I-02	17.0400	2.1200	14.9200	0.1800	2.6856			(29a)				
WT-I-11	7.6800		7.6800	0.1800	1.3824			(29a)				
Flat Roof	23.5800		23.5800	0.1300	3.0654			(30)				
Total net area of external elements Aum(A, m2)			87.3200					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			23.6328		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.5480 (36)				
Total fabric heat loss						(33) + (36) =		37.1808 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.7543	Feb 26.5927	Mar 26.4342	Apr 25.6901	May 25.5508	Jun 24.9027	Jul 24.9027	Aug 24.7827	Sep 25.1524	Oct 25.5508	Nov 25.8325	Dec 26.1270 (38)
Heat transfer coeff	63.9351	63.7734	63.6150	62.8708	62.7316	62.0835	62.0835	61.9634	62.3331	62.7316	63.0133	63.3077 (39)
Average = Sum(39)m / 12 =												62.8702 (39)
HLP	Jan 1.1207	Feb 1.1179	Mar 1.1151	Apr 1.1020	May 1.0996	Jun 1.0882	Jul 1.0882	Aug 1.0861	Sep 1.0926	Oct 1.0996	Nov 1.1045	Dec 1.1097 (40)
HLP (average)												1.1020 (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												1.8971 (42)
Average daily hot water use (litres/day)												79.2566 (43)
Daily hot water use	87.1823	84.0120	80.8417	77.6715	74.5012	71.3310	71.3310	74.5012	77.6715	80.8417	84.0120	87.1823 (44)
Energy conte	129.2888	113.0768	116.6851	101.7289	97.6113	84.2312	78.0526	89.5664	90.6362	105.6277	115.3009	125.2093 (45)
Energy content (annual)										Total = Sum(45)m =		1247.0152 (45)
Distribution loss (46)m = 0.15 x (45)m												
19.3933	16.9615	17.5028	15.2593	14.6417	12.6347	11.7079	13.4350	13.5954	15.8442	17.2951	18.7814 (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												

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
	44.4271	38.6685	41.1961	38.3037	37.9650	35.1769	36.3495	37.9650	38.3037	41.1961	41.4306	44.4271	44.4271	44.4271	(61)
Total heat required for water heating calculated for each month															
Solar input	173.7159	151.7454	157.8812	140.0327	135.5763	119.4081	114.4020	127.5314	128.9399	146.8238	156.7315	169.6364	169.6364	169.6364	(62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =															0.0000 (63)
Output from w/h															
	173.7159	151.7454	157.8812	140.0327	135.5763	119.4081	114.4020	127.5314	128.9399	146.8238	156.7315	169.6364	169.6364	169.6364	(64)
Total per year (kWh/year) = Sum (64)m =															1722.4246 (64)
Heat gains from water heating, kWh/month															
	54.0953	47.2652	49.0968	43.4008	41.9470	36.8011	35.0398	39.2721	39.7125	45.4202	48.6952	52.7389	52.7389	52.7389	(65)

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

Metabolic gains (Table 5), Watts															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5															
	16.6054	14.7488	11.9945	9.0806	6.7879	5.7306	6.1921	8.0487	10.8030	13.7169	16.0096	17.0669	17.0669	17.0669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
	165.4506	167.1675	162.8410	153.6306	142.0040	131.0767	123.7766	122.0597	126.3862	135.5966	147.2232	158.1505	158.1505	158.1505	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5															
	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	(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	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)															
	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	(71)
Water heating gains (Table 5)															
	72.7087	70.3351	65.9904	60.2789	56.3804	51.1126	47.0966	52.7851	55.1562	61.0487	67.6322	70.8856	70.8856	70.8856	(72)
Total internal gains															
	309.2215	306.7081	295.2827	277.4469	259.6291	242.3767	231.5221	237.3503	246.8022	264.8190	285.3218	300.5598	300.5598	300.5598	(73)

6. Solar gains

[Jan]		Area	Solar flux												
		m2	Table 6a	g	Specific data	Specific data	FF	Access	Gains						
			W/m2	or Table 6b	or Table 6c	or Table 6c		factor	W						
								Table 6d							
North		6.4200	10.6334	0.6300			0.7000	0.7700						20.8631	(74)
Solar gains	20.8631	39.8704	67.7496	108.8233	146.5949	156.9342	146.5181	116.2434	81.4570	47.4605	25.7373	17.3925	17.3925	17.3925	(83)
Total gains	330.0846	346.5785	363.0323	386.2701	406.2240	399.3109	378.0402	353.5938	328.2592	312.2796	311.0591	317.9523	317.9523	317.9523	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)															
Utilisation factor for gains for living area, nil,m (see Table 9a)															21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
tau	61.9661	62.1231	62.2779	63.0150	63.1549	63.8142	63.8142	63.9378	63.5586	63.1549	62.8726	62.5801	62.5801	62.5801	
alpha	5.1311	5.1415	5.1519	5.2010	5.2103	5.2543	5.2543	5.2625	5.2372	5.2103	5.1915	5.1720	5.1720	5.1720	
util living area	0.9983	0.9975	0.9950	0.9853	0.9485	0.8380	0.6807	0.7382	0.9294	0.9887	0.9970	0.9986	0.9986	0.9986	(86)
MIT	19.7783	19.8723	20.0702	20.3687	20.6709	20.8956	20.9737	20.9600	20.7920	20.4290	20.0609	19.7628	19.7628	19.7628	(87)
Th 2	19.9840	19.9863	19.9885	19.9992	20.0012	20.0105	20.0105	20.0122	20.0069	20.0012	19.9971	19.9929	19.9929	19.9929	(88)
util rest of house	0.9978	0.9966	0.9931	0.9789	0.9233	0.7597	0.5480	0.6108	0.8837	0.9825	0.9958	0.9982	0.9982	0.9982	(89)
MIT 2	18.3516	18.4906	18.7812	19.2215	19.6467	19.9311	19.9994	19.9930	19.8166	19.3127	18.7743	18.3353	18.3353	18.3353	(90)
Living area fraction															
MIT	19.0906	19.2063	19.4489	19.8157	20.1772	20.4307	20.5040	20.4939	20.3218	19.8909	19.4407	19.0747	19.0747	19.0747	(92)
Temperature adjustment												0.0000	0.0000	0.0000	
adjusted MIT	19.0906	19.2063	19.4489	19.8157	20.1772	20.4307	20.5040	20.4939	20.3218	19.8909	19.4407	19.0747	19.0747	19.0747	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9971	0.9957	0.9917	0.9774	0.9286	0.7962	0.6174	0.6771	0.9008	0.9816	0.9948	0.9976	0.9976	0.9976	(94)
Useful gains	329.1131	345.0923	360.0323	377.5247	377.2014	317.9399	233.4029	239.4039	295.6991	306.5469	309.4499	317.1846	317.1846	317.1846	(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	4.2000	4.2000	(96)
Heat loss rate W	945.6358	912.3596	823.7438	686.2798	531.7862	361.9896	242.3749	253.6722	387.8261	582.8331	777.6294	941.6827	941.6827	941.6827	(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	1.0000	(97a)
Space heating kWh	458.6929	381.2036	345.0014	222.3037	115.0111	0.0000	0.0000	0.0000	0.0000	205.5570	337.0892	464.6265	464.6265	464.6265	(98)
Space heating												2529.4854	2529.4854	2529.4854	(98)
Space heating per m2												(98) / (4) =	44.3380	44.3380	(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													2708.2285 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	458.6929	381.2036	345.0014	222.3037	115.0111	0.0000	0.0000	0.0000	0.0000	205.5570	337.0892	464.6265	(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)	491.1058	408.1409	369.3805	238.0125	123.1382	0.0000	0.0000	0.0000	0.0000	220.0824	360.9093	497.4588	(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	173.7159	151.7454	157.8812	140.0327	135.5763	119.4081	114.4020	127.5314	128.9399	146.8238	156.7315	169.6364	(64)
Efficiency of water heater	87.3810	87.2745	86.9659	86.2094	84.6402	80.3000	80.3000	80.3000	80.3000	85.8983	86.9297	87.4579	(216)
(217)m	87.3810	87.2745	86.9659	86.2094	84.6402	80.3000	80.3000	80.3000	80.3000	85.8983	86.9297	87.4579	(217)
Fuel for water heating, kWh/month	198.8029	173.8714	181.5439	162.4332	160.1796	148.7025	142.4683	158.8187	160.5727	170.9274	180.2967	193.9635	(219)
Water heating fuel used												2032.5808	(219)
Annual totals kWh/year													
Space heating fuel - main system												2708.2285	(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)												293.2562	(232)
Total delivered energy for all uses												5109.0655	(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	2708.2285	0.2160	584.9774 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.5808	0.2160	439.0375 (264)
Space and water heating			1024.0148 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	293.2562	0.5190	152.2000 (268)
Total CO2, kg/m2/year			1215.1398 (272)
Emissions per m2 for space and water heating			17.9494 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6678 (272b)
Emissions per m2 for pumps and fans			0.6823 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.9494 * 1.00) + 2.6678 + 0.6823, rounded to 2 d.p.			21.3000 (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	57.0500 (1b)	x 2.4000 (2b)	= 136.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.9200 (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) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					3.4600
Number of sides sheltered					0.3191 (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) =				0.2712 (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	0.3458	0.3390	0.3322	0.2983	0.2916	0.2576	0.2576	0.2509	0.2712	0.2916	0.3051	0.3187 (22b)
Effective ac	0.5598	0.5575	0.5552	0.5445	0.5425	0.5332	0.5332	0.5315	0.5368	0.5425	0.5465	0.5508 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			6.4200	1.2357	7.9335		(27)
WT-E-03	39.0200	6.4200	32.6000	0.1600	5.2160		(29a)
WT-I-02	17.0400	2.1200	14.9200	0.1584	2.3636		(29a)
WT-I-11	7.6800		7.6800	0.3600	2.7648		(29a)
Flat Roof	23.5800		23.5800	0.1500	3.5370		(30)
Total net area of external elements Aum(A, m ²)			87.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.9349		(33)
Party Wall 1			14.6400	0.0000	0.0000		(32)
Party Floor 1			57.0500				(32d)
Party Ceilings 1			33.4700				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

100.0000 (35)
14.8229 (36)
(33) + (36) = 38.7578 (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	25.2932	25.1883	25.0854	24.6025	24.5121	24.0915	24.0915	24.0136	24.2535	24.5121	24.6949	24.8860 (38)
Heat transfer coeff	64.0509	63.9460	63.8432	63.3603	63.2699	62.8493	62.8493	62.7714	63.0113	63.2699	63.4527	63.6438 (39)
Average = Sum(39)m / 12 =												63.3598 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1227	1.1209	1.1191	1.1106	1.1090	1.1017	1.1017	1.1003	1.1045	1.1090	1.1122	1.1156 (40)
HLP (average)												1.1106 (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 1.8971 (42)
Average daily hot water use (litres/day) 79.2566 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.1823	84.0120	80.8417	77.6715	74.5012	71.3310	71.3310	74.5012	77.6715	80.8417	84.0120	87.1823 (44)
Energy conte	129.2888	113.0768	116.6851	101.7289	97.6113	84.2312	78.0526	89.5664	90.6362	105.6277	115.3009	125.2093 (45)
Energy content (annual)										Total = Sum(45)m =		1247.0152 (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:												

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	27.4739	24.0288	24.7956	21.6174	20.7424	17.8991	16.5862	19.0329	19.2602	22.4459	24.5014	26.6070 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6054	14.7488	11.9945	9.0806	6.7879	5.7306	6.1921	8.0487	10.8030	13.7169	16.0096	17.0669	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	165.4506	167.1675	162.8410	153.6306	142.0040	131.0767	123.7766	122.0597	126.3862	135.5966	147.2232	158.1505	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	(71)
Water heating gains (Table 5)	36.9272	35.7572	33.3274	30.0242	27.8796	24.8599	22.2932	25.5818	26.7503	30.1692	34.0298	35.7621	(72)
Total internal gains	270.4400	269.1302	259.6197	244.1921	228.1283	213.1240	203.7187	207.1471	215.3962	230.9395	248.7194	262.4363	(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					6.4200	10.6334	0.4500	0.0000			0.7700			23.6543 (74)
Solar gains	23.6543	45.2046	76.8136	123.3824	166.2074	177.9299	166.1203	131.7953	92.3549	53.8101	29.1806	19.7194	(83)	
Total gains	294.0943	314.3348	336.4334	367.5745	394.3356	391.0539	369.8390	338.9424	307.7511	284.7497	277.9000	282.1556	(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	24.7416	24.7822	24.8221	25.0113	25.0470	25.2146	25.2146	25.2459	25.1498	25.0470	24.9749	24.8999	
alpha	2.6494	2.6521	2.6548	2.6674	2.6698	2.6810	2.6810	2.6831	2.6767	2.6698	2.6650	2.6600	
util living area	0.9761	0.9697	0.9556	0.9214	0.8528	0.7385	0.6160	0.6678	0.8389	0.9364	0.9680	0.9786	(86)
MIT	18.5259	18.7074	19.0873	19.6413	20.1991	20.6387	20.8449	20.8012	20.4381	19.7568	19.0549	18.4863	(87)
Th 2	19.9823	19.9838	19.9853	19.9922	19.9935	19.9995	19.9995	20.0006	19.9972	19.9935	19.9909	19.9881	(88)
util rest of house	0.9724	0.9650	0.9480	0.9067	0.8216	0.6749	0.5131	0.5702	0.7925	0.9217	0.9621	0.9752	(89)
MIT 2	17.7108	17.8920	18.2696	18.8189	19.3557	19.7592	19.9234	19.8962	19.5909	18.9392	18.2438	17.6756	(90)
Living area fraction	18.1330	18.3143	18.6931	19.2449	19.7926	20.2148	20.4007	20.3650	20.0297	19.3627	18.6639	18.0955	(91)
MIT	18.1330	18.3143	18.6931	19.2449	19.7926	20.2148	20.4007	20.3650	20.0297	19.3627	18.6639	18.0955	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1330	18.3143	18.6931	19.2449	19.7926	20.2148	20.4007	20.3650	20.0297	19.3627	18.6639	18.0955	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	283.3253	300.0749	314.8258	328.3619	321.1273	269.8064	206.1158	206.3839	244.4367	259.1473	264.5347	272.8111	(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	(95)
Heat loss rate W	886.0156	857.7936	778.4484	655.4541	512.0160	352.8843	238.8709	248.8873	373.6393	554.4147	733.7617	884.3641	(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	448.4016	374.7870	344.9353	235.5064	142.0212	0.0000	0.0000	0.0000	0.0000	219.6789	337.8434	454.9954	(98)
Space heating												2558.1692	(98)
Space heating per m2												44.8408	(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	590.7834	465.0848	477.0627	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6870	0.7561	0.7216	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	405.8610	351.6701	344.2401	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	529.0155	502.9035	468.1510	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	88.6713	112.5177	92.1898	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												293.3787 (104)
Cooled Fraction												1.0000 (105)
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	0.0000	22.1678	28.1294	23.0474	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												73.3447 (107)
Space cooling per m2												1.2856 (108)
Energy for space heating												44.8408 (99)
Energy for space cooling												1.2856 (108)
Total												46.1264 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.1 (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	57.0500 (1b)	x 2.4000 (2b)	= 136.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.9200 (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) = 0.1461 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3961 (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) =	0.3367 (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	0.4292	0.4208	0.4124	0.3703	0.3619	0.3198	0.3198	0.3114	0.3367	0.3619	0.3787	0.3956 (22b)
	0.5921	0.5885	0.5850	0.5686	0.5655	0.5511	0.5511	0.5485	0.5567	0.5655	0.5717	0.5782 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200			(26)				
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114			(27)				
WT-E-03	39.0200	6.4200	32.6000	0.1800	5.8680			(29a)				
WT-I-02	17.0400	2.1200	14.9200	0.1800	2.6856			(29a)				
WT-I-11	7.6800		7.6800	0.1800	1.3824			(29a)				
Flat Roof	23.5800		23.5800	0.1300	3.0654			(30)				
Total net area of external elements Aum(A, m2)			87.3200					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	23.6328			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.5480 (36)				
Total fabric heat loss						(33) + (36) =		37.1808 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.7543	Feb 26.5927	Mar 26.4342	Apr 25.6901	May 25.5508	Jun 24.9027	Jul 24.9027	Aug 24.7827	Sep 25.1524	Oct 25.5508	Nov 25.8325	Dec 26.1270 (38)
Heat transfer coeff	63.9351	63.7734	63.6150	62.8708	62.7316	62.0835	62.0835	61.9634	62.3331	62.7316	63.0133	63.3077 (39)
Average = Sum(39)m / 12 =												62.8702 (39)
HLP	Jan 1.1207	Feb 1.1179	Mar 1.1151	Apr 1.1020	May 1.0996	Jun 1.0882	Jul 1.0882	Aug 1.0861	Sep 1.0926	Oct 1.0996	Nov 1.1045	Dec 1.1097 (40)
HLP (average)												1.1020 (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												1.8971 (42)
Average daily hot water use (litres/day)												79.2566 (43)
Daily hot water use	87.1823	84.0120	80.8417	77.6715	74.5012	71.3310	71.3310	74.5012	77.6715	80.8417	84.0120	87.1823 (44)
Energy conte	129.2888	113.0768	116.6851	101.7289	97.6113	84.2312	78.0526	89.5664	90.6362	105.6277	115.3009	125.2093 (45)
Energy content (annual)										Total = Sum(45)m =		1247.0152 (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												

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 (57)
Heat gains from water heating, kWh/month	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)
	27.4739	24.0288	24.7956	21.6174	20.7424	17.8991	16.5862	19.0329	19.2602	22.4459	24.5014	26.6070 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560	94.8560 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6054	14.7488	11.9945	9.0806	6.7879	5.7306	6.1921	8.0487	10.8030	13.7169	16.0096	17.0669 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	165.4506	167.1675	162.8410	153.6306	142.0040	131.0767	123.7766	122.0597	126.3862	135.5966	147.2232	158.1505 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856	32.4856 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848 (71)
Water heating gains (Table 5)	36.9272	35.7572	33.3274	30.0242	27.8796	24.8599	22.2932	25.5818	26.7503	30.1692	34.0298	35.7621 (72)
Total internal gains	270.4400	269.1302	259.6197	244.1921	228.1283	213.1240	203.7187	207.1471	215.3962	230.9395	248.7194	262.4363 (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					6.4200	10.6334	0.6300	0.7000			0.7700	20.8631 (74)

Solar gains	20.8631	39.8704	67.7496	108.8233	146.5949	156.9342	146.5181	116.2434	81.4570	47.4605	25.7373	17.3925 (83)
Total gains	291.3031	309.0006	327.3694	353.0154	374.7232	370.0582	350.2369	323.3905	296.8532	278.4001	274.4567	279.8288 (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	61.9661	62.1231	62.2779	63.0150	63.1549	63.8142	63.8142	63.9378	63.5586	63.1549	62.8726	62.5801
alpha	5.1311	5.1415	5.1519	5.2010	5.2103	5.2543	5.2543	5.2625	5.2372	5.2103	5.1915	5.1720
util living area	0.9991	0.9985	0.9969	0.9900	0.9619	0.8684	0.7210	0.7829	0.9507	0.9932	0.9983	0.9993 (86)
MIT	19.7146	19.8107	20.0125	20.3170	20.6296	20.8735	20.9656	20.9470	20.7540	20.3754	20.0009	19.6999 (87)
Th 2	19.9840	19.9863	19.9885	19.9992	20.0012	20.0105	20.0105	20.0122	20.0069	20.0012	19.9971	19.9929 (88)
util rest of house	0.9988	0.9980	0.9957	0.9855	0.9420	0.7968	0.5868	0.6580	0.9151	0.9893	0.9976	0.9990 (89)
MIT 2	18.8059	18.9038	19.1070	19.4181	19.7224	19.9421	20.0001	19.9938	19.8463	19.4789	19.1026	18.7985 (90)
Living area fraction									fLA = Living area / (4) =			0.5180 (91)
MIT	19.2765	19.3736	19.5760	19.8837	20.1923	20.4246	20.5002	20.4875	20.3164	19.9433	19.5679	19.2654 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2765	19.3736	19.5760	19.8837	20.1923	20.4246	20.5002	20.4875	20.3164	19.9433	19.5679	19.2654 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9984	0.9976	0.9950	0.9849	0.9466	0.8303	0.6573	0.7233	0.9285	0.9890	0.9972	0.9988 (94)
Ext temp.	290.8509	308.2595	325.7372	347.6679	354.6986	307.2413	230.2056	233.9087	275.6241	275.3484	273.6959	279.4804 (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	957.5267	923.0283	831.8285	690.5550	532.7366	361.6092	242.1385	253.2763	387.4900	586.1202	785.6429	953.7551 (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	496.0068	413.1247	376.5319	246.8787	132.4603	0.0000	0.0000	0.0000	0.0000	231.2142	368.6018	501.6604 (98)
												2766.4787 (98)
										(98) / (4) =		48.4922 (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	583.5846	459.4176	470.9221	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7733	0.8579	0.8206	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	451.2734	394.1462	386.4393	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	504.4751	479.9919	449.9736	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	38.3052	63.8692	47.2694	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												149.4438 (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	9.5763	15.9673	11.8174	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													37.3610 (107)
Energy for space heating													0.6549 (108)
Energy for space cooling													48.4922 (99)
Total													0.6549 (108)
Target Fabric Energy Efficiency (TFEE)													49.1471 (109)
													56.5 (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	57.0500 (1b)	x 2.4000 (2b)	= 136.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.9200 (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					3.4600
Infiltration rate					0.1730 (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) =				0.1471 (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	0.1544	0.1471	0.1471	0.1360	0.1360	0.1213	0.1250	0.1176	0.1213	0.1287	0.1287	0.1397 (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)			6.4200	1.2357	7.9335		(27)
WT-E-03	39.0200	6.4200	32.6000	0.1600	5.2160		(29a)
WT-I-02	17.0400	2.1200	14.9200	0.1584	2.3636		(29a)
WT-I-11	7.6800		7.6800	0.3600	2.7648		(29a)
Flat Roof	23.5800		23.5800	0.1500	3.5370		(30)
Total net area of external elements Aum(A, m ²)			87.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.9349	(33)
Party Wall 1			14.6400	0.0000	0.0000		(32)
Party Floor 1			57.0500				(32d)
Party Ceilings 1			33.4700				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8229 (36)
Total fabric heat loss (33) + (36) = 38.7578 (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	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918 (38)
Heat transfer coeff	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496 (39)
Average = Sum(39)m / 12 =												61.3496 (39)
HLP	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754 (40)
HLP (average)												1.0754 (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 1.8971 (42)
Average daily hot water use (litres/day) 79.2566 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	87.1823	84.0120	80.8417	77.6715	74.5012	71.3310	71.3310	74.5012	77.6715	80.8417	84.0120	87.1823 (44)
Energy conte	129.2888	113.0768	116.6851	101.7289	97.6113	84.2312	78.0526	89.5664	90.6362	105.6277	115.3009	125.2093 (45)
Energy content (annual)												Total = Sum(45)m = 1247.0152 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	19.3933	16.9615	17.5028	15.2593	14.6417	12.6347	11.7079	13.4350	13.5954	15.8442	17.2951	18.7814 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0271	12.6533	13.9830	13.5024	13.9311	13.4570	13.8902	13.9167	13.4818	13.9615	13.5453	14.0185 (61)
Total heat required for water heating calculated for each month	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (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	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	46.4953	40.7614	42.2935	37.2005	35.9385	31.3711	29.4250	33.2600	33.5070	38.6116	41.7239	45.1367 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1411.3830 (64)
												1411 (64)

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	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.5134	36.8719	29.9862	22.7015	16.9696	14.3265	15.4803	20.1218	27.0075	34.2922	40.0241	42.6672 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.9412	249.5037	243.0463	229.2994	211.9463	195.6369	184.7412	182.1787	188.6361	202.3830	219.7361	236.0455 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848 (71)
Water heating gains (Table 5)	62.4937	60.6568	56.8462	51.6673	48.3045	43.5710	39.5498	44.7043	46.5374	51.8973	57.9498	60.6676 (72)
Total internal gains	440.1706	436.2546	419.1010	392.8905	366.4427	342.7566	328.9935	336.2271	351.4033	377.7948	406.9322	428.6026 (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					6.4200	11.9814	0.4500	0.0000			0.7700	26.6531 (74)	

Solar gains		26.6531	46.2413	78.4165	130.3669	170.8487	195.3851	180.5989	146.8414	102.4689	59.0255	33.7711	21.9503 (83)
Total gains		466.8237	482.4959	497.5175	523.2574	537.2914	538.1417	509.5923	483.0685	453.8722	436.8203	440.7034	450.5530 (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	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310
alpha	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221
util living area	0.9250	0.9144	0.8843	0.8191	0.6974	0.5095	0.3568	0.3848	0.6374	0.8233	0.9000	0.9303 (86)
MIT	19.2524	19.3811	19.7321	20.1886	20.6269	20.8953	20.9731	20.9665	20.7862	20.3022	19.7112	19.2117 (87)
Th 2	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210 (88)
util rest of house	0.9147	0.9025	0.8672	0.7905	0.6463	0.4270	0.2507	0.2755	0.5629	0.7894	0.8838	0.9206 (89)
MIT 2	18.4509	18.5767	18.9188	19.3546	19.7527	19.9666	20.0134	20.0109	19.8914	19.4687	18.9023	18.4116 (90)
Living area fraction	18.8660	18.9934	19.3401	19.7866	20.2055	20.4476	20.5105	20.5059	20.3549	19.9004	19.3213	18.8260 (92)
Temperature adjustment	18.7160	18.8434	19.1901	19.6366	20.0555	20.2976	20.3605	20.3559	20.2049	19.7504	19.1713	-0.1500 (93)
adjusted MIT												18.6760 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8978	0.8852	0.8500	0.7777	0.6483	0.4514	0.2885	0.3142	0.5780	0.7786	0.8670	0.9041 (94)
Ext temp.	419.0992	427.0941	422.9060	406.9523	348.3259	242.9160	147.0355	151.7738	262.3236	340.1258	382.0818	407.3246 (95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	835.3384	812.4769	723.3150	597.3355	432.8516	263.6580	150.9500	156.8019	307.0475	500.0257	685.3533	832.8842 (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	309.6819	258.9772	223.5043	137.0759	62.8871	0.0000	0.0000	0.0000	0.0000	118.9655	218.3555	316.6163 (98)
RHI space heating demand												1646.0638 (98)
												1646 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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	57.0500 (1b)	x 2.4000 (2b)	= 136.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.9200 (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					3.4600
Infiltration rate					0.1730 (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) =				0.1471 (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	0.1875	0.1838	0.1801	0.1618	0.1581	0.1397	0.1397	0.1360	0.1471	0.1581	0.1654	0.1728 (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)			6.4200	1.2357	7.9335		(27)
WT-E-03	39.0200	6.4200	32.6000	0.1600	5.2160		(29a)
WT-I-02	17.0400	2.1200	14.9200	0.1584	2.3636		(29a)
WT-I-11	7.6800		7.6800	0.3600	2.7648		(29a)
Flat Roof	23.5800		23.5800	0.1500	3.5370		(30)
Total net area of external elements Aum(A, m ²)			87.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.9349	(33)
Party Wall 1			14.6400	0.0000	0.0000		(32)
Party Floor 1			57.0500				(32d)
Party Ceilings 1			33.4700				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

100.0000 (35)
14.8229 (36)
(33) + (36) = 38.7578 (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	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918 (38)
Heat transfer coeff	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496 (39)
Average = Sum(39)m / 12 =												61.3496 (39)
HLP	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754 (40)
HLP (average)												1.0754 (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												1.8971 (42)
Average daily hot water use (litres/day)												79.2566 (43)
Daily hot water use	87.1823	84.0120	80.8417	77.6715	74.5012	71.3310	71.3310	74.5012	77.6715	80.8417	84.0120	87.1823 (44)
Energy conte	129.2888	113.0768	116.6851	101.7289	97.6113	84.2312	78.0526	89.5664	90.6362	105.6277	115.3009	125.2093 (45)
Energy content (annual)												Total = Sum(45)m = 1247.0152 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	19.3933	16.9615	17.5028	15.2593	14.6417	12.6347	11.7079	13.4350	13.5954	15.8442	17.2951	18.7814 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0271	12.6533	13.9830	13.5024	13.9311	13.4570	13.8902	13.9167	13.4818	13.9615	13.5453	14.0185 (61)
Total heat required for water heating calculated for each month	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (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	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (64)
Heat gains from water heating, kWh/month	46.4953	40.7614	42.2935	37.2005	35.9385	31.3711	29.4250	33.2600	33.5070	38.6116	41.7239	45.1367 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1411.3830 (64)												

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	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.5134	36.8719	29.9862	22.7015	16.9696	14.3265	15.4803	20.1218	27.0075	34.2922	40.0241	42.6672 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.9412	249.5037	243.0463	229.2994	211.9463	195.6369	184.7412	182.1787	188.6361	202.3830	219.7361	236.0455 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848 (71)
Water heating gains (Table 5)	62.4937	60.6568	56.8462	51.6673	48.3045	43.5710	39.5498	44.7043	46.5374	51.8973	57.9498	60.6676 (72)
Total internal gains	440.1706	436.2546	419.1010	392.8905	366.4427	342.7566	328.9935	336.2271	351.4033	377.7948	406.9322	428.6026 (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					6.4200	10.6334		0.4500	0.0000		0.7700	23.6543 (74)
Solar gains	23.6543	45.2046	76.8136	123.3824	166.2074	177.9299	166.1203	131.7953	92.3549	53.8101	29.1806	19.7194 (83)
Total gains	463.8249	481.4592	495.9146	516.2728	532.6501	520.6865	495.1138	468.0224	443.7581	431.6049	436.1128	448.3220 (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	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310
alpha	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221
util living area	0.9332	0.9221	0.8983	0.8471	0.7559	0.6218	0.4921	0.5317	0.7139	0.8544	0.9142	0.9386 (86)
MIT	19.0979	19.2520	19.5723	20.0195	20.4603	20.7786	20.9155	20.8928	20.6575	20.1343	19.5403	19.0394 (87)
Th 2	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210 (88)
util rest of house	0.9243	0.9116	0.8837	0.8236	0.7156	0.5548	0.3993	0.4397	0.6546	0.8274	0.9008	0.9303 (89)
MIT 2	18.2986	18.4498	18.7632	19.1946	19.6053	19.8805	19.9818	19.9684	19.7871	19.3110	18.7356	18.2416 (90)
Living area fraction									fLA = Living area / (4) =			0.5180 (91)
MIT	18.7126	18.8653	19.1823	19.6219	20.0481	20.3457	20.4654	20.4472	20.2380	19.7375	19.1524	18.6549 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5626	18.7153	19.0323	19.4719	19.8981	20.1957	20.3154	20.2972	20.0880	19.5875	19.0024	18.5049 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	421.0705	430.6610	429.5812	417.3705	378.1945	295.5264	212.1705	218.6190	292.4805	351.1244	385.4982	409.9348 (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	875.0053	847.5624	768.8511	648.5810	502.9517	343.2936	227.9387	239.0912	367.3596	551.3766	730.2087	877.5968 (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	337.7275	280.1577	252.4168	166.4716	92.8193	0.0000	0.0000	0.0000	0.0000	148.9877	248.1916	347.9405 (98)
Space heating												1874.7127 (98)
Space heating per m2										(98) / (4) =		32.8609 (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													2071.5057 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	337.7275	280.1577	252.4168	166.4716	92.8193	0.0000	0.0000	0.0000	0.0000	148.9877	248.1916	347.9405	(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)	373.1796	309.5666	278.9136	183.9465	102.5628	0.0000	0.0000	0.0000	0.0000	164.6272	274.2449	384.4646	(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	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278	(64)
Efficiency of water heater (217)m	89.5224	89.4840	89.3825	89.1631	88.7249	87.3000	87.3000	87.3000	87.3000	89.0466	89.3804	87.3000	(216)
Fuel for water heating, kWh/month	160.0895	140.5057	146.1899	129.2366	125.7172	111.8994	105.3181	118.5374	119.2645	134.2995	144.1548	155.4545	(219)
Water heating fuel used												1590.6671	(219)
Annual totals kWh/year													
Space heating fuel - main system												2071.5057	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													30.7358 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													105.7358 (231)
Electricity for lighting (calculated in Appendix L)													293.2562 (232)
Total delivered energy for all uses													4061.1649 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2071.5057	3.4800	72.0884 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1590.6671	3.4800	55.3552 (247)
Mechanical ventilation fans	30.7358	13.1900	4.0541 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	293.2562	13.1900	38.6805 (250)
Additional standing charges			120.0000 (251)
Total energy cost			300.0707 (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] =	1.2350 (257)
SAP value		82.7720
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	2071.5057	0.2160	447.4452 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1590.6671	0.2160	343.5841 (264)
Space and water heating			791.0293 (265)
Pumps and fans	105.7358	0.5190	54.8769 (267)
Energy for lighting	293.2562	0.5190	152.2000 (268)
Total kg/year			998.1062 (272)
CO2 emissions per m2			17.5000 (273)
EI value			86.8940
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4
Water heating energy efficiency	$3.48 / 0.8862 = 3.927$, stars = 4
Water heating environmental impact	$0.216 / 0.8862 = 0.2437$, 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	57.0500 (1b)	x 2.4000 (2b)	= 136.9200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 136.9200 (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					3.4600
Infiltration rate					0.1730 (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) =				0.1471 (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	0.1544	0.1471	0.1471	0.1360	0.1360	0.1213	0.1250	0.1176	0.1213	0.1287	0.1287	0.1397 (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)			6.4200	1.2357	7.9335		(27)
WT-E-03	39.0200	6.4200	32.6000	0.1600	5.2160		(29a)
WT-I-02	17.0400	2.1200	14.9200	0.1584	2.3636		(29a)
WT-I-11	7.6800		7.6800	0.3600	2.7648		(29a)
Flat Roof	23.5800		23.5800	0.1500	3.5370		(30)
Total net area of external elements Aum(A, m ²)			87.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.9349	(33)
Party Wall 1			14.6400	0.0000	0.0000		(32)
Party Floor 1			57.0500				(32d)
Party Ceilings 1			33.4700				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

100.0000 (35)
14.8229 (36)
(33) + (36) = 38.7578 (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	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918	22.5918 (38)
Heat transfer coeff	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496	61.3496 (39)
Average = Sum(39)m / 12 =												61.3496 (39)
HLP	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754	1.0754 (40)
HLP (average)												1.0754 (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												1.8971 (42)
Average daily hot water use (litres/day)												79.2566 (43)
Daily hot water use	87.1823	84.0120	80.8417	77.6715	74.5012	71.3310	71.3310	74.5012	77.6715	80.8417	84.0120	87.1823 (44)
Energy conte	129.2888	113.0768	116.6851	101.7289	97.6113	84.2312	78.0526	89.5664	90.6362	105.6277	115.3009	125.2093 (45)
Energy content (annual)												Total = Sum(45)m = 1247.0152 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Distribution loss (46)m = 0.15 x (45)m	19.3933	16.9615	17.5028	15.2593	14.6417	12.6347	11.7079	13.4350	13.5954	15.8442	17.2951	18.7814 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	14.0271	12.6533	13.9830	13.5024	13.9311	13.4570	13.8902	13.9167	13.4818	13.9615	13.5453	14.0185 (61)
Total heat required for water heating calculated for each month	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (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	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278 (64)
Heat gains from water heating, kWh/month	46.4953	40.7614	42.2935	37.2005	35.9385	31.3711	29.4250	33.2600	33.5070	38.6116	41.7239	45.1367 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1411.3830 (64)												

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	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272	113.8272 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.5134	36.8719	29.9862	22.7015	16.9696	14.3265	15.4803	20.1218	27.0075	34.2922	40.0241	42.6672 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.9412	249.5037	243.0463	229.2994	211.9463	195.6369	184.7412	182.1787	188.6361	202.3830	219.7361	236.0455 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798	48.2798 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848	-75.8848 (71)
Water heating gains (Table 5)	62.4937	60.6568	56.8462	51.6673	48.3045	43.5710	39.5498	44.7043	46.5374	51.8973	57.9498	60.6676 (72)
Total internal gains	440.1706	436.2546	419.1010	392.8905	366.4427	342.7566	328.9935	336.2271	351.4033	377.7948	406.9322	428.6026 (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	6.4200				11.9814		0.4500		0.0000		0.7700		26.6531 (74)	
Solar gains	26.6531	46.2413	78.4165	130.3669	170.8487	195.3851	180.5989	146.8414	102.4689	59.0255	33.7711	21.9503	(83)	
Total gains	466.8237	482.4959	497.5175	523.2574	537.2914	538.1417	509.5923	483.0685	453.8722	436.8203	440.7034	450.5530	(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	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310	25.8310
alpha	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221	2.7221
util living area	0.9250	0.9144	0.8843	0.8191	0.6974	0.5095	0.3568	0.3848	0.6374	0.8233	0.9000	0.9303 (86)
MIT	19.2524	19.3811	19.7321	20.1886	20.6269	20.8953	20.9731	20.9665	20.7862	20.3022	19.7112	19.2117 (87)
Th 2	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210	20.0210 (88)
util rest of house	0.9147	0.9025	0.8672	0.7905	0.6463	0.4270	0.2507	0.2755	0.5629	0.7894	0.8838	0.9206 (89)
MIT 2	18.4509	18.5767	18.9188	19.3546	19.7527	19.9666	20.0134	20.0109	19.8914	19.4687	18.9023	18.4116 (90)
Living area fraction									fLA = Living area / (4) =			0.5180 (91)
MIT	18.8660	18.9934	19.3401	19.7866	20.2055	20.4476	20.5105	20.5059	20.3549	19.9004	19.3213	18.8260 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.7160	18.8434	19.1901	19.6366	20.0555	20.2976	20.3605	20.3559	20.2049	19.7504	19.1713	18.6760 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8978	0.8852	0.8500	0.7777	0.6483	0.4514	0.2885	0.3142	0.5780	0.7786	0.8670	0.9041 (94)
Ext temp.	419.0992	427.0941	422.9060	406.9523	348.3259	242.9160	147.0355	151.7738	262.3236	340.1258	382.0818	407.3246 (95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Month fracti	835.3384	812.4769	723.3150	597.3355	432.8516	263.6580	150.9500	156.8019	307.0475	500.0257	685.3533	832.8842 (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	309.6819	258.9772	223.5043	137.0759	62.8871	0.0000	0.0000	0.0000	0.0000	118.9655	218.3555	316.6163 (98)
Space heating per m2										(98) / (4) =		28.8530 (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													1818.8550 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	309.6819	258.9772	223.5043	137.0759	62.8871	0.0000	0.0000	0.0000	0.0000	118.9655	218.3555	316.6163	(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)	342.1900	286.1627	246.9661	151.4651	69.4885	0.0000	0.0000	0.0000	0.0000	131.4536	241.2768	349.8523	(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	143.3159	125.7301	130.6681	115.2314	111.5424	97.6882	91.9427	103.4832	104.1179	119.5892	128.8462	139.2278	(64)
Efficiency of water heater (217)m	89.4625	89.4287	89.2924	89.0099	88.4273	87.3000	87.3000	87.3000	87.3000	88.8670	89.2855	87.3000	(216)
Fuel for water heating, kWh/month	160.1965	140.5926	146.3372	129.4590	126.1403	111.8994	105.3181	118.5374	119.2645	134.5709	144.3081	155.5653	(219)
Water heating fuel used												1592.1894	(219)
Annual totals kWh/year													
Space heating fuel - main system												1818.8550	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 3.8640, total flow = 21.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													30.7358 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													105.7358 (231)
Electricity for lighting (calculated in Appendix L)													293.2562 (232)
Total delivered energy for all uses													3810.0364 (238)

10a. Fuel costs - using BEDF prices (478)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1818.8550	3.8700	70.3897 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1592.1894	3.8700	61.6177 (247)
Mechanical ventilation fans	30.7358	18.9000	5.8091 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	293.2562	18.9000	55.4254 (250)
Additional standing charges			93.0000 (251)
Total energy cost			300.4169 (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	1818.8550	0.2160	392.8727 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1592.1894	0.2160	343.9129 (264)
Space and water heating			736.7856 (265)
Pumps and fans	105.7358	0.5190	54.8769 (267)
Energy for lighting	293.2562	0.5190	152.2000 (268)
Total kg/year			943.8624 (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	1818.8550	1.2200	2219.0031 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1592.1894	1.2200	1942.4711 (264)
Space and water heating			4161.4742 (265)
Pumps and fans	105.7358	3.0700	324.6089 (267)
Energy for lighting	293.2562	3.0700	900.2965 (268)
Primary energy kWh/year			5386.3796 (272)
Primary energy kWh/m2/year			94.4151 (273)

SAP 2012 EPC IMPROVEMENTS

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	
Potential energy efficiency rating:		B 83	
Potential environmental impact rating:			B 87

Fuel prices for cost data on this page from database revision number 478 TEST (27 May 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	£75	£75	£0
Mains gas	£225	£225	£0
Space heating	£183	£183	£0
Water heating	£62	£62	£0
Lighting	£55	£55	£0
Total cost of fuels	£300	£300	£0
Total cost of uses	£300	£300	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	17 kg/m²	17 kg/m²	0 kg/m²
Primary energy	94 kWh/m²	94 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
Overshading	Average or unknown
Thermal mass parameter	100.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	271.10 (P1)
Transmission heat loss coefficient	38.76 (37)
Summer heat loss coefficient	309.86 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
North	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	6.4200	81.1852	0.4500 0.0000
total:			0.9000 211.0896

	Jun	Jul	Aug	
Solar gains	228	211	172	(P4)
Internal gains	340	326	333	
Total summer gains	568	537	505	(P5)
Summer gain/loss ratio	1.83	1.73	1.63	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	19.13	20.93	20.73	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			