

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW026z_128_As_Built				Issued on Date	07/07/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	84 B	DER	16.06	TER	17.80	
Environmental	89 B	% DER<TER	9.78			
CO ₂ Emissions (t/year)	0.79	DFEE	32.72	TFEE	38.62	
General Requirements Compliance	Pass	% DFEE<TFEE	15.26			
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) 17.80 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)32.7 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	(no roof)		
Openings	1.23 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.68 (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 3.7 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					3.6800
Infiltration rate					0.1840 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1426 (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	0.1818	0.1783	0.1747	0.1569	0.1533	0.1355	0.1355	0.1319	0.1426	0.1533	0.1604	0.1676 (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	28.1800	6.4200	21.7600	0.1600	3.4816		(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)					
Total net area of external elements Aum(A, m2)			52.9000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		18.6635		(33)					
Party Wall 1			25.6800	0.0000	0.0000		(32)					
Party Floor 1			57.0500				(32d)					
Party Ceilings 1			57.0500				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9274 (36)					
Total fabric heat loss							(33) + (36) = 24.5909 (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	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)
Average = Sum(39)m / 12 =	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827 (39)
												47.1827 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270 (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												

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	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)
								Solar input (sum of months) = Sum(63)m =				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)
								Total per year (kWh/year) = Sum(64)m =				1411.3830 (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)

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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													1690.2066 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	282.5857	231.3424	203.3874	127.1189	64.2658	0.0000	0.0000	0.0000	0.0000	121.3962	207.5935	291.9470	(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)	312.2494	255.6270	224.7375	140.4629	71.0120	0.0000	0.0000	0.0000	0.0000	134.1394	229.3851	322.5934	(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	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	89.3973	89.3468	89.2208	88.9497	88.4432	87.3000	87.3000	87.3000	87.3000	88.8832	89.2472	89.4414	(216)
Fuel for water heating, kWh/month	160.3134	140.7214	146.4548	129.5466	126.1176	111.8994	105.3181	118.5374	119.2645	134.5465	144.3700	155.6638	(219)
Water heating fuel used												1592.7536	(219)
Annual totals kWh/year													
Space heating fuel - main system												1690.2066	(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													3681.9521 (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	1690.2066	0.2160	365.0846 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1592.7536	0.2160	344.0348 (264)
Space and water heating			709.1194 (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			916.1962 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.0600 (273)

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

DER		16.0600	ZC1
Total Floor Area		57.0500	
Assumed number of occupants		1.8971	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		17.1854	ZC2
CO2 emissions from cooking, equation (L16)		2.8840	ZC3
Total CO2 emissions		36.1293	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		36.1293	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	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 * 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) = 0.1461 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3961 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3070 (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	0.3914	0.3837	0.3760	0.3377	0.3300	0.2916	0.2916	0.2839	0.3070	0.3300	0.3453	0.3607 (22b)
Effective ac	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114		(27)
WT-E-03	28.1800	6.4200	21.7600	0.1800	3.9168		(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)
Total net area of external elements Aum, m ²			52.9000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 18.6162		(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)							4.7965 (36)
Total fabric heat loss						(33) + (36) =	23.4127 (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	26.0522	25.9178	25.7861	25.1674	25.0517	24.5129	24.5129	24.4131	24.7204	25.0517	25.2858	25.5306 (38)
Heat transfer coeff	49.4648	49.3304	49.1987	48.5801	48.4644	47.9255	47.9255	47.8258	48.1331	48.4644	48.6985	48.9433 (39)
Average = Sum(39)m / 12 =												48.5795 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8670	0.8647	0.8624	0.8515	0.8495	0.8401	0.8401	0.8383	0.8437	0.8495	0.8536	0.8579 (40)
HLP (average)												0.8515 (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	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)

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Combi loss	44.4271	38.6685	41.1961	38.3037	37.9650	35.1769	36.3495	37.9650	38.3037	41.1961	41.4306	44.4271 (61)
Total heat required for water heating calculated for each month	173.7159	151.7454	157.8812	140.0327	135.5763	119.4081	114.4020	127.5314	128.9399	146.8238	156.7315	169.6364 (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	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)
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 (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	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)	72.7087	70.3351	65.9904	60.2789	56.3804	51.1126	47.0966	52.7851	55.1562	61.0487	67.6322	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	(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	330.0846	346.5785	363.0323	386.2701	406.2240	399.3109	378.0402	353.5938	328.2592	312.2796	311.0591	317.9523 (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	80.0934	80.3116	80.5266	81.5520	81.7468	82.6658	82.6658	82.8383	82.3094	81.7468	81.3537	80.9468	
alpha	6.3396	6.3541	6.3684	6.4368	6.4498	6.5111	6.5111	6.5226	6.4873	6.4498	6.4236	6.3965	
util living area	0.9982	0.9971	0.9933	0.9760	0.9063	0.7310	0.5522	0.6112	0.8714	0.9821	0.9963	0.9986	(86)
MIT	20.1381	20.2209	20.3871	20.6330	20.8562	20.9742	20.9963	20.9932	20.9197	20.6564	20.3614	20.1224	(87)
Th 2	20.1956	20.1976	20.1996	20.2089	20.2106	20.2187	20.2187	20.2203	20.2156	20.2106	20.2071	20.2034	(88)
util rest of house	0.9976	0.9961	0.9909	0.9668	0.8723	0.6566	0.4572	0.5133	0.8149	0.9737	0.9949	0.9981	(89)
MIT 2	19.0339	19.1564	19.4000	19.7603	20.0624	20.2006	20.2172	20.2172	20.1470	19.7981	19.3690	19.0170	(90)
Living area fraction	19.6099	19.7117	19.9149	20.2155	20.4765	20.6041	20.6236	20.6220	20.5501	20.2458	19.8867	19.5936	(91)
MIT	19.6099	19.7117	19.9149	20.2155	20.4765	20.6041	20.6236	20.6220	20.5501	20.2458	19.8867	19.5936	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6099	19.7117	19.9149	20.2155	20.4765	20.6041	20.6236	20.6220	20.5501	20.2458	19.8867	19.5936	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9971	0.9954	0.9899	0.9669	0.8848	0.6945	0.5070	0.5646	0.8411	0.9741	0.9942	0.9977	(94)
Ext temp.	329.1193	344.9786	359.3576	373.4936	359.4385	277.3401	191.6481	199.6462	276.1009	304.1960	309.2458	317.2136	(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	757.3028	730.6687	659.9979	549.7100	425.3469	287.7505	192.8354	201.9211	310.4623	467.4785	622.6929	753.4143	(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	(98)
Space heating per m2	318.5685	259.1838	223.6764	126.8758	49.0358	0.0000	0.0000	0.0000	0.0000	121.4822	225.6819	324.5333	(99)
												1649.0377	(98)
												28.9051	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1765.5649 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.5685	259.1838	223.6764	126.8758	49.0358	0.0000	0.0000	0.0000	0.0000	121.4822	225.6819	324.5333	(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)	341.0798	277.4987	239.4822	135.8413	52.5009	0.0000	0.0000	0.0000	0.0000	130.0665	241.6294	347.4661	(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	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	86.5582	86.3976	85.9279	84.8039	82.7559	80.3000	80.3000	80.3000	80.3000	84.5785	85.9683	86.6584	(216)
Fuel for water heating, kWh/month	200.6927	175.6564	183.7368	165.1254	163.8269	148.7025	142.4683	158.8187	160.5727	173.5946	182.3130	195.7531	(219)
Water heating fuel used												2051.2610	(219)
Annual totals kWh/year													
Space heating fuel - main system												1765.5649	(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												4185.0822	(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	1765.5649	0.2160	381.3620 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2051.2610	0.2160	443.0724 (264)
Space and water heating			824.4344 (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			1015.5594 (272)
Emissions per m2 for space and water heating			14.4511 (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) = (14.4511 * 1.00) + 2.6678 + 0.6823, rounded to 2 d.p.			17.8000 (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 * 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					3.6800
Number of sides sheltered					0.3301 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2558 (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	0.3262	0.3198	0.3134	0.2814	0.2750	0.2430	0.2430	0.2366	0.2558	0.2750	0.2878	0.3006 (22b)
Effective ac	0.5532	0.5511	0.5491	0.5396	0.5378	0.5295	0.5295	0.5280	0.5327	0.5378	0.5414	0.5452 (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	28.1800	6.4200	21.7600	0.1600	3.4816		(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)
Total net area of external elements Aum, m ²			52.9000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6635		(33)
Party Wall 1			25.6800	0.0000	0.0000		(32)
Party Floor 1			57.0500				(32d)
Party Ceilings 1			57.0500				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9274 (36)
Total fabric heat loss						(33) + (36) =	24.5909 (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	24.9950	24.9017	24.8102	24.3806	24.3002	23.9260	23.9260	23.8567	24.0701	24.3002	24.4628	24.6328 (38)
Heat transfer coeff	49.5859	49.4926	49.4011	48.9714	48.8911	48.5169	48.5169	48.4476	48.6610	48.8911	49.0537	49.2237 (39)
Average = Sum(39)m / 12 =												48.9711 (39)
HLP	0.8692	0.8675	0.8659	0.8584	0.8570	0.8504	0.8504	0.8492	0.8530	0.8570	0.8598	0.8628 (40)
HLP (average)												0.8584 (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 content (annual)	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)
Distribution loss	Total = Sum(45)m = 1247.0152 (45)											
	(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 (46)
Water storage loss:												
Total storage loss												

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	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 L13, 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	31.9591	32.0194	32.0787	32.3601	32.4133	32.6633	32.6633	32.7100	32.5666	32.4133	32.3059	32.1943	
alpha	3.1306	3.1346	3.1386	3.1573	3.1609	3.1776	3.1776	3.1807	3.1711	3.1609	3.1537	3.1463	
util living area	0.9744	0.9665	0.9483	0.9025	0.8107	0.6670	0.5299	0.5857	0.7923	0.9227	0.9642	0.9774	(86)
MIT	19.1214	19.2885	19.6200	20.0915	20.5295	20.8264	20.9388	20.9149	20.6790	20.1435	19.5590	19.0832	(87)
Th 2	20.1938	20.1952	20.1966	20.2030	20.2042	20.2098	20.2098	20.2109	20.2077	20.2042	20.2018	20.1992	(88)
util rest of house	0.9709	0.9618	0.9406	0.8872	0.7794	0.6102	0.4493	0.5057	0.7468	0.9075	0.9584	0.9742	(89)
MIT 2	18.4503	18.6169	18.9455	19.4108	19.8262	20.0927	20.1785	20.1647	19.9725	19.4682	18.8914	18.4164	(90)
Living area fraction									fLA = Living area / (4) =			0.5216	(91)
MIT	18.8004	18.9672	19.2974	19.7659	20.1931	20.4754	20.5751	20.5561	20.3411	19.8205	19.2397	18.7642	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8004	18.9672	19.2974	19.7659	20.1931	20.4754	20.5751	20.5561	20.3411	19.8205	19.2397	18.7642	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	283.2413	299.5253	312.9745	322.5569	307.1501	246.4593	180.3801	183.7598	232.4106	255.9398	263.9121	272.8597	(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	719.0126	696.2235	632.2033	532.1175	415.2365	285.0554	192.8606	201.3508	303.6967	450.7994	595.4948	716.9047	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	324.2139	266.5812	237.5062	150.8836	80.4162	0.0000	0.0000	0.0000	0.0000	144.9755	238.7396	330.3695	(98)
Space heating												1773.6856	(98)
Space heating per m2												31.0900	(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	456.0585	359.0248	368.2015	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8137	0.8702	0.8430	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	371.1070	312.4202	310.4026	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	113.6941	141.7196	117.3648	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												372.7786	(104)

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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	28.4235	35.4299	29.3412	0.0000	0.0000	0.0000 (107)
Space cooling											93.1946 (107)
Space cooling per m2											1.6336 (108)
Energy for space heating											31.0900 (99)
Energy for space cooling											1.6336 (108)
Total											32.7236 (109)
Dwelling Fabric Energy Efficiency (DFEE)											32.7 (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	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 * 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)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3070 (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	0.3914	0.3837	0.3760	0.3377	0.3300	0.2916	0.2916	0.2839	0.3070	0.3300	0.3453	0.3607 (22b)
	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.4200	1.3258	8.5114		(27)
WT-E-03	28.1800	6.4200	21.7600	0.1800	3.9168		(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)
Total net area of external elements Aum, m ²			52.9000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6162		(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)							4.7965 (36)
Total fabric heat loss						(33) + (36) =	23.4127 (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	26.0522	25.9178	25.7861	25.1674	25.0517	24.5129	24.5129	24.4131	24.7204	25.0517	25.2858	25.5306 (38)
Heat transfer coeff	49.4648	49.3304	49.1987	48.5801	48.4644	47.9255	47.9255	47.8258	48.1331	48.4644	48.6985	48.9433 (39)
Average = Sum(39)m / 12 =												48.5795 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8670	0.8647	0.8624	0.8515	0.8495	0.8401	0.8401	0.8383	0.8437	0.8495	0.8536	0.8579 (40)
HLP (average)												0.8515 (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:												
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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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												
(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											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	6.4200											
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	80.0934	80.3116	80.5266	81.5520	81.7468	82.6658	82.6658	82.8383	82.3094	81.7468	81.3537	80.9468
alpha	6.3396	6.3541	6.3684	6.4368	6.4498	6.5111	6.5111	6.5226	6.4873	6.4498	6.4236	6.3965
util living area	0.9991	0.9985	0.9962	0.9847	0.9314	0.7736	0.5931	0.6616	0.9098	0.9901	0.9982	0.9993 (86)
MIT	20.0714	20.1566	20.3273	20.5818	20.8229	20.9643	20.9945	20.9895	20.8918	20.6023	20.2988	20.0566 (87)
Th 2	20.1956	20.1976	20.1996	20.2089	20.2106	20.2187	20.2187	20.2203	20.2156	20.2106	20.2071	20.2034 (88)
util rest of house	0.9988	0.9980	0.9948	0.9785	0.9035	0.7001	0.4926	0.5590	0.8628	0.9851	0.9975	0.9991 (89)
MIT 2	19.3359	19.4227	19.5945	19.8538	20.0819	20.2010	20.2172	20.2169	20.1489	19.8771	19.5728	19.3277 (90)
Living area fraction	19.7196	19.8056	19.9767	20.2336	20.4685	20.5992	20.6227	20.6199	20.5365	20.2554	19.9515	19.7079 (92)
MIT	19.7196	19.8056	19.9767	20.2336	20.4685	20.5992	20.6227	20.6199	20.5365	20.2554	19.9515	19.7079 (93)
Temperature adjustment												0.0000
adjusted MIT	19.7196	19.8056	19.9767	20.2336	20.4685	20.5992	20.6227	20.6199	20.5365	20.2554	19.9515	19.7079 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9986	0.9976	0.9943	0.9787	0.9137	0.7375	0.5453	0.6129	0.8842	0.9855	0.9972	0.9989 (94)
Useful gains	290.8998	308.2735	325.5078	345.4920	342.3728	272.9224	190.9910	198.2122	262.4791	274.3564	273.6820	279.5299 (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	762.7266	735.2976	663.0375	550.5858	424.9581	287.5131	192.7881	201.8194	309.8073	467.9425	625.8493	759.0078 (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	351.0392	286.9602	251.1222	147.6676	61.4435	0.0000	0.0000	0.0000	0.0000	144.0280	253.5604	356.7316 (98)
Space heating												1852.5527 (98)
Space heating per m2												32.4724 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	450.5002	354.6491	363.4759	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9106	0.9594	0.9402	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	410.2063	340.2583	341.7551	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	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)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	67.8735	103.9618	80.5145	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												252.3498 (104)
Intermittency factor (Table 10b)												1.0000 (105)
	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)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	16.9684	25.9904	20.1286	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													63.0875 (107)
Space cooling per m2													1.1058 (108)
Energy for space heating													32.4724 (99)
Energy for space cooling													1.1058 (108)
Total													33.5783 (109)
Target Fabric Energy Efficiency (TFEE)													38.6 (109)

FULL SAP CALCULATION PRINTOUT

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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					3.6800
Infiltration rate					0.1840 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1426 (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	0.1497	0.1426	0.1426	0.1319	0.1319	0.1176	0.1212	0.1141	0.1176	0.1248	0.1248	0.1355 (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	28.1800	6.4200	21.7600	0.1600	3.4816		(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)
Total net area of external elements Aum(A, m ²)				52.9000			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6635		(33)
Party Wall 1				25.6800	0.0000	0.0000	(32)
Party Floor 1				57.0500			(32d)
Party Ceilings 1				57.0500			(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)
5.9274 (36)
(33) + (36) = 24.5909 (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	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827 (39)
Average = Sum(39)m / 12 =												47.1827 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270 (40)
HLP (average)												0.8270 (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												

Regs Region: England

Elmhurst Energy Systems
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	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)

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, Th _l (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869
alpha	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391
util living area	0.9062	0.8917	0.8507	0.7644	0.6167	0.4208	0.2834	0.3075	0.5503	0.7699	0.8720	0.9134 (86)
MIT	19.8463	19.9550	20.2297	20.5637	20.8374	20.9667	20.9935	20.9915	20.9157	20.6219	20.1922	19.8059 (87)
Th 2	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300 (88)
util rest of house	0.8953	0.8792	0.8329	0.7363	0.5726	0.3613	0.2145	0.2356	0.4903	0.7366	0.8551	0.9032 (89)
MIT 2	19.1864	19.2917	19.5566	19.8699	20.1119	20.2119	20.2278	20.2270	20.1777	19.9287	19.5240	19.1476 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.5216 (91)
MIT	19.5307	19.6377	19.9077	20.2318	20.4904	20.6056	20.6273	20.6258	20.5627	20.2903	19.8726	19.4910 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3807	19.4877	19.7577	20.0818	20.3404	20.4556	20.4773	20.4758	20.4127	20.1403	19.7226	19.3410 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8814	0.8654	0.8208	0.7305	0.5792	0.3791	0.2369	0.2588	0.5050	0.7324	0.8425	0.8894 (94)
Useful gains	411.4576	417.5433	408.3468	382.2318	311.1948	204.0123	120.7066	125.0396	229.2177	319.9279	371.3028	400.7240 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	673.8000	655.2579	583.0700	480.4051	346.3393	210.2277	121.6017	126.2515	245.9491	402.9562	553.1034	671.9276 (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	195.1827	159.7442	129.9941	70.6847	26.1475	0.0000	0.0000	0.0000	0.0000	61.7730	130.8964	201.7755 (98)
Space heating												976.1982 (98)
RHI space heating demand												976 (98)

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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	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					3.6800
Infiltration rate					0.1840 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1426 (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	0.1818	0.1783	0.1747	0.1569	0.1533	0.1355	0.1355	0.1319	0.1426	0.1533	0.1604	0.1676 (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	28.1800	6.4200	21.7600	0.1600	3.4816		(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)	
Total net area of external elements Aum(A, m2)			52.9000				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		18.6635		(33)	
Party Wall 1			25.6800	0.0000	0.0000		(32)	
Party Floor 1			57.0500				(32d)	
Party Ceilings 1			57.0500				(32b)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.9274 (36)
Total fabric heat loss						(33) + (36) =	24.5909 (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	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)
Average = Sum(39)m / 12 =	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270 (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											

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	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)

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, 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	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869
alpha	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391
util living area	0.9173	0.9023	0.8697	0.8010	0.6855	0.5336	0.4043	0.4423	0.6356	0.8106	0.8914	0.9247 (86)
MIT	19.7219	19.8531	20.1083	20.4451	20.7403	20.9150	20.9739	20.9646	20.8466	20.5033	20.0582	19.6667 (87)
Th 2	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300 (88)
util rest of house	0.9079	0.8911	0.8544	0.7772	0.6484	0.4802	0.3386	0.3750	0.5840	0.7833	0.8773	0.9160 (89)
MIT 2	19.0646	19.1924	19.4398	19.7599	20.0287	20.1749	20.2171	20.2117	20.1239	19.8200	19.3947	19.0111 (90)
Living area fraction									fLA = Living area / (4) =			0.5216 (91)
MIT	19.4075	19.5371	19.7885	20.1173	20.3999	20.5610	20.6119	20.6044	20.5009	20.1764	19.7408	19.3531 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2575	19.3871	19.6385	19.9673	20.2499	20.4110	20.4619	20.4544	20.3509	20.0264	19.5908	19.2031 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8941	0.8772	0.8413	0.7684	0.6494	0.4931	0.3588	0.3951	0.5925	0.7754	0.8640	0.9024 (94)
Useful gains	414.7129	422.3343	417.2130	396.7216	345.9221	256.7719	177.6285	184.9193	262.9351	334.6865	376.8105	404.5738 (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	705.7328	683.5379	619.9100	522.1849	403.4065	274.1769	182.2144	191.2992	294.9349	444.7651	589.3483	707.8857 (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	216.5188	175.5288	150.8065	90.3335	42.7684	0.0000	0.0000	0.0000	0.0000	81.8985	153.0272	225.6640 (98)
Space heating												1136.5459 (98)
Space heating per m2										(98) / (4) =		19.9219 (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													1255.8518 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	216.5188	175.5288	150.8065	90.3335	42.7684	0.0000	0.0000	0.0000	0.0000	81.8985	153.0272	225.6640	(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)	239.2473	193.9545	166.6370	99.8161	47.2579	0.0000	0.0000	0.0000	0.0000	90.4956	169.0908	249.3525	(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	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	89.1978	89.1364	88.9858	88.6779	88.1640	87.3000	87.3000	87.3000	87.3000	88.5730	89.0086	89.2517	(216)
Fuel for water heating, kWh/month	160.6720	141.0536	146.8415	129.9437	126.5170	111.8994	105.3181	118.5374	119.2645	135.0177	144.7569	155.9946	(219)
Water heating fuel used												1595.8164	(219)
Annual totals kWh/year													
Space heating fuel - main system												1255.8518	(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													3250.6602 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1255.8518	3.4800	43.7036 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1595.8164	3.4800	55.5344 (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			271.8651 (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] =	1.1189 (257)
SAP value		84.3914
SAP rating (Section 12)		84 (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	1255.8518	0.2160	271.2640 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1595.8164	0.2160	344.6963 (264)
Space and water heating			615.9603 (265)
Pumps and fans	105.7358	0.5190	54.8769 (267)
Energy for lighting	293.2562	0.5190	152.2000 (268)
Total kg/year			823.0372 (272)
CO2 emissions per m2			14.4300 (273)
EI value			89.1928
EI rating			89 (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	$3.48 / 0.8835 = 3.939$, stars = 4
Water heating environmental impact	$0.216 / 0.8835 = 0.2445$, stars = 4

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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					3.6800
Infiltration rate					0.1840 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1426 (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	0.1497	0.1426	0.1426	0.1319	0.1319	0.1176	0.1212	0.1141	0.1176	0.1248	0.1248	0.1355 (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	28.1800	6.4200	21.7600	0.1600	3.4816		(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)
Total net area of external elements Aum(A, m ²)				52.9000			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6635		(33)
Party Wall 1				25.6800	0.0000	0.0000	(32)
Party Floor 1				57.0500			(32d)
Party Ceilings 1				57.0500			(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)
5.9274 (36)
(33) + (36) = 24.5909 (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	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827	47.1827 (39)
Average = Sum(39)m / 12 =												47.1827 (39)
HLP	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270	0.8270 (40)
HLP (average)												0.8270 (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												

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r16

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	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)

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, 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	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	33.5869	
alpha	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	3.2391	
util living area	0.9062	0.8917	0.8507	0.7644	0.6167	0.4208	0.2834	0.3075	0.5503	0.7699	0.8720	0.9134	(86)
MIT	19.8463	19.9550	20.2297	20.5637	20.8374	20.9667	20.9935	20.9915	20.9157	20.6219	20.1922	19.8059	(87)
Th 2	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	20.2300	(88)
util rest of house	0.8953	0.8792	0.8329	0.7363	0.5726	0.3613	0.2145	0.2356	0.4903	0.7366	0.8551	0.9032	(89)
MIT 2	19.1864	19.2917	19.5566	19.8699	20.1119	20.2119	20.2278	20.2270	20.1777	19.9287	19.5240	19.1476	(90)
Living area fraction	19.5307	19.6377	19.9077	20.2318	20.4904	20.6056	20.6273	20.6258	20.5627	20.2903	19.8726	19.4910	(92)
Temperature adjustment	19.3807	19.4877	19.7577	20.0818	20.3404	20.4556	20.4773	20.4758	20.4127	20.1403	19.7226	19.3410	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	411.4576	417.5433	408.3468	382.2318	311.1948	204.0123	120.7066	125.0396	229.2177	319.9279	371.3028	400.7240	(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	673.8000	655.2579	583.0700	480.4051	346.3393	210.2277	121.6017	126.2515	245.9491	402.9562	553.1034	671.9276	(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	195.1827	159.7442	129.9941	70.6847	26.1475	0.0000	0.0000	0.0000	0.0000	61.7730	130.8964	201.7755	(98)
Space heating												976.1982	(98)
Space heating per m2												17.1113	(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	1078.6720 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	195.1827	159.7442	129.9941	70.6847	26.1475	0.0000	0.0000	0.0000	0.0000	61.7730	130.8964	201.7755 (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)	215.6715	176.5130	143.6399	78.1047	28.8923	0.0000	0.0000	0.0000	0.0000	68.2575	144.6369	222.9563 (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	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	89.1170	89.0622	88.8671	88.4896	87.8902	87.3000	87.3000	87.3000	87.3000	88.3642	88.8838	87.3000 (216)
Fuel for water heating, kWh/month	160.8177	141.1711	147.0377	130.2202	126.9112	111.8994	105.3181	118.5374	119.2645	135.3367	144.9602	156.1453 (219)
Water heating fuel used												1597.6195 (219)
Annual totals kWh/year												
Space heating fuel - main system												1078.6720 (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												3075.2836 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1078.6720	3.8700	41.7446 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1597.6195	3.8700	61.8279 (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			271.9820 (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	1078.6720	0.2160	232.9932 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1597.6195	0.2160	345.0858 (264)
Space and water heating			578.0790 (265)
Pumps and fans	105.7358	0.5190	54.8769 (267)
Energy for lighting	293.2562	0.5190	152.2000 (268)
Total kg/year			785.1558 (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	1078.6720	1.2200	1315.9799 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1597.6195	1.2200	1949.0958 (264)
Space and water heating			3265.0757 (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			4489.9811 (272)
Primary energy kWh/m2/year			78.7026 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: B 89

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
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	Not applicable
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Not applicable
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
L2	Not applicable
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 84	
Potential environmental impact rating:			B 89

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	£197	£197	£0
Space heating	£155	£155	£0
Water heating	£62	£62	£0
Lighting	£55	£55	£0
Total cost of fuels	£272	£272	£0
Total cost of uses	£272	£272	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	79 kWh/m²	79 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	24.59 (37)
Summer heat loss coefficient	295.69 (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	1.92	1.82	1.71	(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	19.22	21.02	20.81	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			