

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW027d_065_As_Built				Issued on Date	07/05/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	84 B	DER	16.63	TER	18.65	
Environmental	87 B	% DER<TER	10.83			
CO ₂ Emissions (t/year)	1.05	DFEE	40.44	TFEE	50.24	
General Requirements Compliance	Pass	% DFEE<TFEE	19.52			
Assessor Details	Mr. Robert Price, Robert Price, Tel: 01635 261582, keith@southernenergyconsultants.co.uk				Assessor ID	P865-0001
Client	Bellway Homes Thames Valley					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Mid-floor flat, total floor area 73 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) 18.65 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.63 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.4 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.25 (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: 3.31 (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 West: 10.22 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.3 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					3.3100
Infiltration rate					0.1655 (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) =				0.1283 (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	0.1635	0.1603	0.1571	0.1411	0.1379	0.1218	0.1218	0.1186	0.1283	0.1379	0.1443	0.1507 (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)			10.2200	1.2357	12.6293		(27)
FT-03			73.2300	0.1300	9.5199		(28b)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum(A, m ²)				127.1800			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8956		(33)
Party Wall 1				17.7000	0.0000		(32)
Party Wall 2				17.7000	0.0000		(32)
Party Ceilings 1				73.2300			(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)
 15.0540 (36)
 (33) + (36) = 45.9496 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991 (38)
Heat transfer coeff	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487 (39)
Average = Sum(39)m / 12 =												74.9487 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235 (40)
HLP (average)												1.0235 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (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	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096 (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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768 (71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146 (72)
Total internal gains	355.0104	352.8725	339.9726	319.2986	298.4157	278.3103	265.2884	271.1668	281.8369	302.7149	326.6306	344.4635 (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	
West					10.2200	19.6403	0.4500	0.0000	0.7700		69.5507 (80)	
Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951 (83)
Total gains	424.5611	488.9284	564.0373	646.0836	698.9030	688.2803	655.5966	606.4357	542.4334	464.1567	413.3521	401.6586 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408
alpha	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094
util living area	0.9678	0.9514	0.9170	0.8470	0.7365	0.5944	0.4639	0.5117	0.7196	0.8905	0.9537	0.9722 (86)
MIT	18.8548	19.1081	19.5468	20.0824	20.5349	20.8200	20.9346	20.9121	20.6765	20.0658	19.3477	18.7836 (87)
Th 2	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638 (88)
util rest of house	0.9631	0.9445	0.9048	0.8241	0.6962	0.5299	0.3777	0.4247	0.6626	0.8689	0.9458	0.9681 (89)
MIT 2	18.0926	18.3422	18.7722	19.2875	19.7058	19.9496	20.0333	20.0203	19.8404	19.2831	18.5823	18.0223 (90)
Living area fraction	18.3606	18.6115	19.0445	19.5670	19.9974	20.2557	20.3502	20.3339	20.1344	19.5583	18.8514	18.2900 (92)
Temperature adjustment	18.2106	18.4615	18.8945	19.4170	19.8474	20.1057	20.2002	20.1839	19.9844	19.4083	18.7014	18.1400 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	403.7111	454.3282	499.9072	520.6271	479.3797	366.8652	256.2581	264.7055	356.5123	394.8090	384.8290	384.3488 (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	1042.5801	1016.4190	928.9548	788.2360	610.6343	412.6431	269.8301	283.5972	441.0299	660.1732	869.5103	1044.7820 (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	475.3185	377.7251	319.2114	192.6784	97.6535	0.0000	0.0000	0.0000	0.0000	197.4309	348.9706	491.3623 (98)
Space heating												2500.3506 (98)
Space heating per m2												34.1438 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2762.8184	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	475.3185	377.7251	319.2114	192.6784	97.6535	0.0000	0.0000	0.0000	0.0000	197.4309	348.9706	491.3623	(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)	525.2138	417.3758	352.7198	212.9043	107.9044	0.0000	0.0000	0.0000	0.0000	218.1557	385.6029	542.9417	(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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373	(64)	
Efficiency of water heater (217)m	89.6728	89.6109	89.4728	89.1936	88.6814	87.3000	87.3000	87.3000	87.3000	89.1837	89.5432	89.7105	(216)	
Fuel for water heating, kWh/month	178.2558	156.4385	162.7120	143.7686	139.8435	124.2262	116.7407	131.6471	132.5329	149.2320	160.3543	173.0425	(219)	
Water heating fuel used												1768.7940	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2762.8184	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)														
mechanical ventilation fans (SFP = 0.1840)													39.4528	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													114.4528	(231)
Electricity for lighting (calculated in Appendix L)													346.0160	(232)
Total delivered energy for all uses													4992.0812	(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	2762.8184	0.2160	596.7688	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1768.7940	0.2160	382.0595	(264)
Space and water heating			978.8283	(265)
Pumps and fans	114.4528	0.5190	59.4010	(267)
Energy for lighting	346.0160	0.5190	179.5823	(268)
Total CO2, kg/year			1217.8116	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6300	(273)

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

DER			16.6300	ZC1
Total Floor Area		TFA	73.2300	
Assumed number of occupants		N	2.3219	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.5656	ZC2
CO2 emissions from cooking, equation (L16)			2.3860	ZC3
Total CO2 emissions			35.5816	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			35.5816	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1707 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4207 (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) =				0.3260 (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	0.4157	0.4075	0.3994	0.3586	0.3505	0.3097	0.3097	0.3016	0.3260	0.3505	0.3668	0.3831 (22b)
	0.5864	0.5830	0.5798	0.5643	0.5614	0.5480	0.5480	0.5455	0.5532	0.5614	0.5673	0.5734 (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)			10.2200	1.3258	13.5492		(27)
FT-03			73.2300	0.1300	9.5199		(28b)
WT-E-03	32.1100	10.2200	21.8900	0.1800	3.9402		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1800	3.5496		(29a)
Total net area of external elements Aum, m ²			127.1800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.6789	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.4887 (36)
Total fabric heat loss						(33) + (36) =	46.1676 (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	34.0103	33.8157	33.6250	32.7291	32.5615	31.7812	31.7812	31.6367	32.0817	32.5615	32.9005	33.2550 (38)
Heat transfer coeff	80.1779	79.9833	79.7926	78.8967	78.7291	77.9488	77.9488	77.8043	78.2494	78.7291	79.0682	79.4227 (39)
Average = Sum(39)m / 12 =												78.8959 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0949	1.0922	1.0896	1.0774	1.0751	1.0644	1.0644	1.0625	1.0685	1.0751	1.0797	1.0846 (40)
HLP (average)												1.0774 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)										Total = Sum(45)m =		1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	50.0825	43.5909	46.4401	43.1796	42.7978	39.6548	40.9766	42.7978	43.1796	46.4401	46.7045	50.0825 (61)
Total heat required for water heating calculated for each month	195.8291	171.0618	177.9787	157.8582	152.8346	134.6081	128.9649	143.7656	145.3533	165.5137	176.6826	191.2303 (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	195.8291	171.0618	177.9787	157.8582	152.8346	134.6081	128.9649	143.7656	145.3533	165.5137	176.6826	191.2303 (64)
Heat gains from water heating, kWh/month	60.9814	53.2818	55.3466	48.9255	47.2867	41.4857	39.5002	44.2712	44.7677	51.2020	54.8939	59.4523 (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	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	(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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	(71)
Water heating gains (Table 5)	81.9642	79.2884	74.3906	67.9521	63.5574	57.6190	53.0917	59.5044	62.1773	68.8199	76.2415	79.9090	(72)
Total internal gains	367.1012	364.3590	350.8583	329.5854	308.0996	287.3932	274.3779	280.8569	292.1328	313.6098	338.1223	356.5579	(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	
West					10.2200	19.6403	0.6300	0.7000			0.7700	61.3437 (80)	
Solar gains		61.3437	120.0013	197.6251	288.2244	353.2298	361.5935	344.2518	295.7072	229.8461	142.3917	76.4884	50.4461 (83)
Total gains		428.4449	484.3603	548.4833	617.8097	661.3294	648.9868	618.6297	576.5641	521.9789	456.0014	414.6107	407.0040 (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	63.4266	63.5809	63.7329	64.4566	64.5939	65.2405	65.2405	65.3616	64.9899	64.5939	64.3169	64.0298	
alpha	5.2284	5.2387	5.2489	5.2971	5.3063	5.3494	5.3494	5.3574	5.3327	5.3063	5.2878	5.2687	
util living area	0.9982	0.9963	0.9894	0.9624	0.8810	0.7151	0.5436	0.6015	0.8560	0.9796	0.9964	0.9987	(86)
MIT	19.8194	19.9564	20.2034	20.5320	20.8055	20.9547	20.9913	20.9856	20.8788	20.5162	20.1089	19.7957	(87)
Th 2	20.0050	20.0072	20.0093	20.0193	20.0212	20.0300	20.0300	20.0316	20.0266	20.0212	20.0174	20.0135	(88)
util rest of house	0.9976	0.9950	0.9856	0.9481	0.8374	0.6275	0.4294	0.4845	0.7884	0.9694	0.9949	0.9982	(89)
MIT 2	18.4268	18.6283	18.9888	19.4644	19.8283	19.9994	20.0267	20.0255	19.9270	19.4506	18.8589	18.3982	(90)
Living area fraction									fLA = Living area / (4) =			0.3516	(91)
MIT	18.9165	19.0953	19.4159	19.8398	20.1719	20.3353	20.3659	20.3631	20.2617	19.8253	19.2985	18.8896	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9165	19.0953	19.4159	19.8398	20.1719	20.3353	20.3659	20.3631	20.2617	19.8253	19.2985	18.8896	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9967	0.9934	0.9826	0.9449	0.8450	0.6567	0.4698	0.5259	0.8069	0.9668	0.9934	0.9975	(94)
Ext temp.	427.0316	481.1425	538.9344	583.7946	558.8161	426.1575	290.6613	303.2328	421.1621	440.8400	411.8760	405.9707	(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	1171.9214	1135.8050	1030.5912	863.1166	666.9869	447.0602	293.5467	308.3458	482.1483	726.2984	964.5111	1166.6884	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m ²	554.1980	439.6510	365.7926	201.1119	80.4790	0.0000	0.0000	0.0000	0.0000	212.3810	397.8972	565.9740	(98)
												2817.4848	(98)
												38.4745	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
---	--------------

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3016.5790 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	554.1980	439.6510	365.7926	201.1119	80.4790	0.0000	0.0000	0.0000	0.0000	212.3810	397.8972	565.9740	(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)	593.3598	470.7184	391.6409	215.3232	86.1660	0.0000	0.0000	0.0000	0.0000	227.3887	426.0142	605.9679	(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	195.8291	171.0618	177.9787	157.8582	152.8346	134.6081	128.9649	143.7656	145.3533	165.5137	176.6826	191.2303	(64)
Efficiency of water heater	87.5256	87.3235	86.8256	85.6619	83.5187	80.3000	80.3000	80.3000	80.3000	85.6799	87.0338	87.6168	(216)
Fuel for water heating, kWh/month	223.7392	195.8943	204.9842	184.2805	182.9944	167.6316	160.6038	179.0356	181.0129	193.1768	203.0046	218.2575	(219)
Water heating fuel used												2294.6153	(219)
Annual totals kWh/year													
Space heating fuel - main system												3016.5790	(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)												346.0160	(232)
Total delivered energy for all uses												5732.2103	(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	3016.5790	0.2160	651.5811 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2294.6153	0.2160	495.6369 (264)
Space and water heating			1147.2180 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	346.0160	0.5190	179.5823 (268)
Total CO2, kg/m2/year			1365.7253 (272)
Emissions per m2 for space and water heating			15.6660 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4523 (272b)
Emissions per m2 for pumps and fans			0.5315 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6660 * 1.00) + 2.4523 + 0.5315, rounded to 2 d.p.			18.6500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1707 (8)
Measured/design AP50					Yes
Infiltration rate					3.3100
Number of sides sheltered					0.3362 (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) =				0.2606 (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	0.3322	0.3257	0.3192	0.2866	0.2801	0.2475	0.2475	0.2410	0.2606	0.2801	0.2931	0.3061 (22b)
Effective ac	0.5552	0.5530	0.5509	0.5411	0.5392	0.5306	0.5306	0.5290	0.5339	0.5392	0.5430	0.5469 (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)			10.2200	1.2357	12.6293		(27)
FT-03			73.2300	0.1300	9.5199		(28b)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum, m ²			127.1800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.8956		(33)
Party Wall 1			17.7000	0.0000	0.0000		(32)
Party Wall 2			17.7000	0.0000	0.0000		(32)
Party Ceilings 1			73.2300				(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)							15.0540 (36)
Total fabric heat loss						(33) + (36) =	45.9496 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.1994	32.0751	31.9533	31.3812	31.2741	30.7758	30.7758	30.6835	30.9677	31.2741	31.4907	31.7171 (38)
Heat transfer coeff	78.1490	78.0247	77.9029	77.3308	77.2237	76.7254	76.7254	76.6331	76.9173	77.2237	77.4403	77.6667 (39)
Average = Sum(39)m / 12 =												77.3303 (39)
HLP	1.0672	1.0655	1.0638	1.0560	1.0545	1.0477	1.0477	1.0465	1.0504	1.0545	1.0575	1.0606 (40)
HLP (average)												1.0560 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)										Total = Sum(45)m =		1405.7543 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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)
	30.9712	27.0876	27.9520	24.3692	23.3828	20.1776	18.6975	21.4557	21.7119	25.3031	27.6204	29.9939 (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	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	(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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	(71)
Water heating gains (Table 5)	41.6279	40.3089	37.5698	33.8461	31.4285	28.0244	25.1311	28.8383	30.1554	34.0096	38.3616	40.3144	(72)
Total internal gains	323.7649	322.3795	311.0375	292.4793	272.9708	254.7986	243.4172	247.1908	257.1109	275.7995	297.2425	313.9633	(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
West	10.2200				19.6403		0.4500		0.0000		0.7700		69.5507 (80)
Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951	(83)
Total gains	393.3156	458.4354	535.1022	619.2643	673.4581	664.7686	633.7254	582.4597	517.7074	437.2413	383.9640	371.1584	(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	26.0293	26.0708	26.1116	26.3048	26.3412	26.5123	26.5123	26.5442	26.4461	26.3412	26.2676	26.1910	
alpha	2.7353	2.7381	2.7408	2.7537	2.7561	2.7675	2.7675	2.7696	2.7631	2.7561	2.7512	2.7461	
util living area	0.9734	0.9589	0.9277	0.8622	0.7569	0.6160	0.4847	0.5352	0.7433	0.9051	0.9615	0.9771	(86)
MIT	18.6836	18.9476	19.4077	19.9868	20.4741	20.7938	20.9230	20.8968	20.6313	19.9721	19.2174	18.6280	(87)
Th 2	20.0277	20.0291	20.0305	20.0369	20.0381	20.0437	20.0437	20.0448	20.0416	20.0381	20.0357	20.0332	(88)
util rest of house	0.9694	0.9527	0.9166	0.8404	0.7171	0.5502	0.3945	0.4448	0.6870	0.8853	0.9547	0.9737	(89)
MIT 2	17.8982	18.1600	18.6132	19.1776	19.6320	19.9124	20.0078	19.9935	19.7855	19.1759	18.4347	17.8470	(90)
Living area fraction									fLA = Living area / (4) =			0.3516	(91)
MIT	18.1744	18.4370	18.8926	19.4621	19.9281	20.2223	20.3296	20.3112	20.0829	19.4558	18.7099	18.1216	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1744	18.4370	18.8926	19.4621	19.9281	20.2223	20.3296	20.3112	20.0829	19.4558	18.7099	18.1216	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9593	0.9398	0.9006	0.8254	0.7121	0.5633	0.4227	0.4714	0.6897	0.8708	0.9425	0.9645	(94)
Ext temp.	377.3056	430.8165	481.9269	511.1438	479.5552	374.4542	267.8574	274.5645	357.0469	380.7508	361.8814	357.9834	(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	1084.2699	1056.2184	965.4168	816.7779	635.4032	431.3764	286.1560	299.7239	460.1872	683.8810	899.0774	1081.2473	(97)
Space heating kWh	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	525.9815	420.2700	359.7165	220.0566	115.9510	0.0000	0.0000	0.0000	0.0000	225.5289	386.7811	538.1084	(98)
Space heating per m2												2792.3939	(98)
										(98) / (4) =		38.1318	(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	721.2188	567.7680	582.4117	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7969	0.8535	0.8264	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	574.7283	484.5966	481.2818	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	863.8713	825.8765	767.5582	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	208.1830	253.9123	212.9896	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												675.0849	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled Fraction	FC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.0458	63.4781	53.2474	0.0000	0.0000	0.0000 (107)
Space cooling											168.7712 (107)
Space cooling per m2											2.3047 (108)
Energy for space heating											38.1318 (99)
Energy for space cooling											2.3047 (108)
Total											40.4365 (109)
Dwelling Fabric Energy Efficiency (DFEE)											40.4 (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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1707 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4207 (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) =	0.3260 (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	0.4157	0.4075	0.3994	0.3586	0.3505	0.3097	0.3097	0.3016	0.3260	0.3505	0.3668	0.3831 (22b)
	0.5864	0.5830	0.5798	0.5643	0.5614	0.5480	0.5480	0.5455	0.5532	0.5614	0.5673	0.5734 (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)			10.2200	1.3258	13.5492		(27)
FT-03			73.2300	0.1300	9.5199		(28b)
WT-E-03	32.1100	10.2200	21.8900	0.1800	3.9402		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1800	3.5496		(29a)
Total net area of external elements Aum, m ²			127.1800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.6789	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.4887 (36)
Total fabric heat loss						(33) + (36) =	46.1676 (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	34.0103	33.8157	33.6250	32.7291	32.5615	31.7812	31.7812	31.6367	32.0817	32.5615	32.9005	33.2550 (38)
Heat transfer coeff	80.1779	79.9833	79.7926	78.8967	78.7291	77.9488	77.9488	77.8043	78.2494	78.7291	79.0682	79.4227 (39)
Average = Sum(39)m / 12 =												78.8959 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0949	1.0922	1.0896	1.0774	1.0751	1.0644	1.0644	1.0625	1.0685	1.0751	1.0797	1.0846 (40)
HLP (average)												1.0774 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3219 (42)
Average daily hot water use (litres/day)												89.3456 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)										Total = Sum(45)m =		1405.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.9712	27.0876	27.9520	24.3692	23.3828	20.1776	18.6975	21.4557	21.7119	25.3031	27.6204	29.9939 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960	116.0960 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5929	17.4022	14.1524	10.7143	8.0091	6.7616	7.3061	9.4968	12.7466	16.1847	18.8899	20.1374 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.7153	206.8396	201.4864	190.0901	175.7044	162.1838	153.1512	151.0269	156.3801	167.7764	182.1621	195.6827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096	34.6096 (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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768 (71)
Water heating gains (Table 5)	41.6279	40.3089	37.5698	33.8461	31.4285	28.0244	25.1311	28.8383	30.1554	34.0096	38.3616	40.3144 (72)
Total internal gains	323.7649	322.3795	311.0375	292.4793	272.9708	254.7986	243.4172	247.1908	257.1109	275.7995	297.2425	313.9633 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		W
West					10.2200	19.6403	0.6300		0.7000	0.7700		61.3437 (80)
Solar gains	61.3437	120.0013	197.6251	288.2244	353.2298	361.5935	344.2518	295.7072	229.8461	142.3917	76.4884	50.4461 (83)
Total gains	385.1086	442.3808	508.6626	580.7037	626.2006	616.3922	587.6690	542.8980	486.9570	418.1911	373.7309	364.4094 (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	63.4266	63.5809	63.7329	64.4566	64.5939	65.2405	65.2405	65.3616	64.9899	64.5939	64.3169	64.0298
alpha	5.2284	5.2387	5.2489	5.2971	5.3063	5.3494	5.3494	5.3574	5.3327	5.3063	5.2878	5.2687
util living area	0.9989	0.9976	0.9925	0.9706	0.8993	0.7420	0.5695	0.6333	0.8821	0.9860	0.9978	0.9992 (86)
MIT	19.7638	19.9029	20.1543	20.4918	20.7802	20.9459	20.9892	20.9817	20.8563	20.4715	20.0567	19.7408 (87)
Th 2	20.0050	20.0072	20.0093	20.0193	20.0212	20.0300	20.0300	20.0316	20.0266	20.0212	20.0174	20.0135 (88)
util rest of house	0.9986	0.9967	0.9897	0.9589	0.8598	0.6550	0.4513	0.5128	0.8208	0.9786	0.9969	0.9990 (89)
MIT 2	18.8719	19.0126	19.2643	19.6029	19.8695	20.0045	20.0272	20.0262	19.9432	19.5889	19.1746	18.8558 (90)
Living area fraction	19.1855	19.3256	19.5772	19.9155	20.1897	20.3355	20.3654	20.3622	20.2643	19.8993	19.4847	19.1670 (92)
MIT	19.1855	19.3256	19.5772	19.9155	20.1897	20.3355	20.3654	20.3622	20.2643	19.8993	19.4847	19.1670 (93)
Temperature adjustment												0.0000
adjusted MIT	19.1855	19.3256	19.5772	19.9155	20.1897	20.3355	20.3654	20.3622	20.2643	19.8993	19.4847	19.1670 (93)

8. Space heating requirement

Utilisation	0.9982	0.9959	0.9881	0.9574	0.8675	0.6842	0.4933	0.5557	0.8381	0.9774	0.9962	0.9986 (94)
Useful gains	384.4033	440.5786	502.5932	555.9858	543.2458	421.7458	289.8849	301.6675	408.1001	408.7289	372.3093	363.9111 (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	1193.4913	1153.8106	1043.4676	869.0838	668.3872	447.0783	293.5117	308.2726	482.3535	732.1222	979.2393	1188.7174 (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	601.9615	479.2919	402.4105	225.4306	93.1052	0.0000	0.0000	0.0000	0.0000	240.6046	436.9896	613.6559 (98)
Space heating												3093.4499 (98)
Space heating per m2												(98) / (4) = 42.2429 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	732.7187	576.8211	591.3127	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8803	0.9369	0.9134	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	645.0385	540.4366	540.0808	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	807.3274	772.0444	721.3172	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	116.8481	172.3162	134.8399	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												424.0041 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.2120	43.0790	33.7100	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												106.0010 (107)
Space cooling per m2												1.4475 (108)
Energy for space heating												42.2429 (99)
Energy for space cooling												1.4475 (108)
Total												43.6904 (109)
Target Fabric Energy Efficiency (TFEE)												50.2 (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	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					3.3100
Infiltration rate					0.1655 (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) =				0.1283 (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	0.1347	0.1283	0.1283	0.1186	0.1186	0.1058	0.1090	0.1026	0.1058	0.1122	0.1122	0.1218 (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)			10.2200	1.2357	12.6293		(27)	
FT-03			73.2300	0.1300	9.5199		(28b)	
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)	
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)	
Total net area of external elements Aum(A, m2)			127.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.8956			(33)
Party Wall 1			17.7000	0.0000	0.0000			(32)
Party Wall 2			17.7000	0.0000	0.0000			(32)
Party Ceilings 1			73.2300					(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)
15.0540 (36)
(33) + (36) = 45.9496 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991 (38)
Heat transfer coeff	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487 (39)
Average = Sum(39)m / 12 =												74.9487 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235 (40)
HLP (average)												1.0235 (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
Average daily hot water use (litres/day)

2.3219 (42)
89.3456 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (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 HEAT DEMAND 09 Jan 2014

	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (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	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (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	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.9821	43.5055	35.3811	26.7857	20.0227	16.9040	18.2653	23.7420	31.8664	40.4617	47.2248	50.3435 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.5452	308.7158	300.7260	283.7166	262.2454	242.0654	228.5839	225.4133	233.4031	250.4125	271.8838	292.0638 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534 (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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768 (71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146 (72)
Total internal gains	525.0927	520.7150	500.3038	468.8596	436.8333	408.1973	391.5434	399.6614	417.8428	449.4911	484.5502	510.9137 (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
West	10.2200				22.3313		0.4500		0.0000		0.7700		79.0803 (80)
Solar gains	79.0803	139.1533	225.9604	338.6498	403.5155	441.7215	416.1196	366.0865	284.5456	176.2051	101.0154	64.4008 (83)	
Total gains	604.1730	659.8683	726.2642	807.5094	840.3488	849.9189	807.6629	765.7479	702.3884	625.6962	585.5656	575.3145 (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	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408
alpha	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094
util living area	0.9209	0.8990	0.8470	0.7484	0.6041	0.4151	0.2814	0.3049	0.5459	0.7795	0.8885	0.9287 (86)
MIT	19.3790	19.5686	19.9688	20.4192	20.7654	20.9440	20.9871	20.9837	20.8692	20.4469	19.8415	19.3226 (87)
Th 2	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638 (88)
util rest of house	0.9104	0.8857	0.8268	0.7156	0.5531	0.3452	0.1990	0.2191	0.4759	0.7425	0.8715	0.9190 (89)
MIT 2	18.6056	18.7892	19.1742	19.5946	19.8990	20.0353	20.0602	20.0589	19.9866	19.6307	19.0588	18.5512 (90)
Living area fraction									fLA = Living area / (4) =			0.3516 (91)
MIT	18.8776	19.0632	19.4536	19.8846	20.2036	20.3548	20.3861	20.3841	20.2969	19.9177	19.3341	18.8225 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.7276	18.9132	19.3036	19.7346	20.0536	20.2048	20.2361	20.2341	20.1469	19.7677	19.1841	18.6725 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8919	0.8664	0.8080	0.7030	0.5525	0.3561	0.2145	0.2350	0.4825	0.7294	0.8523	0.9011 (94)
Useful gains	538.8801	571.6793	586.8072	567.6682	464.3245	302.6484	173.2143	179.9519	338.8888	456.3657	499.0819	518.4225 (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	1021.3690	997.8079	892.1604	737.0891	528.6600	315.1474	175.0897	182.4326	370.7665	612.1590	838.2300	1017.2382 (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	358.9718	286.3584	227.1828	121.9831	47.8656	0.0000	0.0000	0.0000	0.0000	115.9102	244.1866	371.1188 (98)
Space heating												1773.5773 (98)
RHI space heating demand												1774 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					3.3100
Infiltration rate					0.1655 (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) =				0.1283 (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	0.1635	0.1603	0.1571	0.1411	0.1379	0.1218	0.1218	0.1186	0.1283	0.1379	0.1443	0.1507 (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)			10.2200	1.2357	12.6293		(27)
FT-03			73.2300	0.1300	9.5199		(28b)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum(A, m ²)				127.1800			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8956		(33)
Party Wall 1				17.7000	0.0000		(32)
Party Wall 2				17.7000	0.0000		(32)
Party Ceilings 1				73.2300			(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)
15.0540 (36)
(33) + (36) = 45.9496 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991 (38)
Heat transfer coeff	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487 (39)
Average = Sum(39)m / 12 =												74.9487 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235 (40)
HLP (average)												1.0235 (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
Average daily hot water use (litres/day)

2.3219 (42)
89.3456 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (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 ENERGY RATINGS 09 Jan 2014

	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (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	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (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	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.9821	43.5055	35.3811	26.7857	20.0227	16.9040	18.2653	23.7420	31.8664	40.4617	47.2248	50.3435	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.5452	308.7158	300.7260	283.7166	262.2454	242.0654	228.5839	225.4133	233.4031	250.4125	271.8838	292.0638	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	(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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	(71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146	(72)
Total internal gains	525.0927	520.7150	500.3038	468.8596	436.8333	408.1973	391.5434	399.6614	417.8428	449.4911	484.5502	510.9137	(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	

West				10.2200	19.6403		0.4500	0.0000		0.7700		69.5507 (80)	

Solar gains	69.5507	136.0559	224.0647	326.7850	400.4873	409.9700	390.3082	335.2689	260.5965	161.4418	86.7215	57.1951 (83)	
Total gains	594.6434	656.7709	724.3685	795.6446	837.3206	818.1673	781.8515	734.9303	678.4393	610.9329	571.2717	568.1088 (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	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	
alpha	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	
util living area	0.9311	0.9085	0.8644	0.7837	0.6667	0.5240	0.3994	0.4377	0.6311	0.8196	0.9071	0.9384	(86)
MIT	19.2191	19.4435	19.8247	20.2770	20.6459	20.8700	20.9553	20.9410	20.7730	20.2888	19.6640	19.1475	(87)
Th 2	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	(88)
util rest of house	0.9221	0.8968	0.8470	0.7558	0.6238	0.4620	0.3219	0.3586	0.5714	0.7898	0.8932	0.9302	(89)
MIT 2	18.4483	18.6668	19.0354	19.4632	19.7970	19.9834	20.0435	20.0355	19.9125	19.4852	18.8867	18.3785	(90)
Living area fraction	18.7194	18.9399	19.3130	19.7493	20.0955	20.2952	20.3641	20.3539	20.2150	19.7678	19.1600	18.6489	(91)
MIT	18.7194	18.9399	19.3130	19.7493	20.0955	20.2952	20.3641	20.3539	20.2150	19.7678	19.1600	18.6489	(92)
Temperature adjustment	18.5694	18.7899	19.1630	19.5993	19.9455	20.1452	20.2141	20.2039	20.0650	19.6178	19.0100	18.4989	(93)
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9044	0.8776	0.8276	0.7404	0.6179	0.4676	0.3347	0.3709	0.5715	0.7735	0.8743	0.9133	(94)
Ext temp.	537.8140	576.4128	599.4589	589.0732	517.4026	382.6064	261.7030	272.5570	387.7145	472.5686	499.4579	518.8364	(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	1069.4694	1041.0303	949.0720	801.9019	617.9887	415.6027	270.8748	285.0995	447.0718	675.8697	892.6384	1071.6853	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating per m ²	395.5516	312.2230	260.1122	153.2367	74.8360	0.0000	0.0000	0.0000	0.0000	151.2560	283.0900	411.3196	(99)
												2041.6250	(98)
												27.8796	(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													2255.9392 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	395.5516	312.2230	260.1122	153.2367	74.8360	0.0000	0.0000	0.0000	0.0000	151.2560	283.0900	411.3196	(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)	437.0736	344.9978	287.4168	169.3223	82.6918	0.0000	0.0000	0.0000	0.0000	167.1337	312.8066	454.4968	(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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373	(64)
Efficiency of water heater (217)m	89.5552	89.4836	89.3250	89.0135	88.4774	87.3000	87.3000	87.3000	87.3000	88.9735	89.3973	89.6001	(216)
Fuel for water heating, kWh/month	178.4898	156.6610	162.9810	144.0594	140.1659	124.2262	116.7407	131.6471	132.5329	149.5845	160.6161	173.2558	(219)
Water heating fuel used												1770.9604	(219)
Annual totals kWh/year													
Space heating fuel - main system												2255.9392	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)													39.4528 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													114.4528 (231)
Electricity for lighting (calculated in Appendix L)													346.0160 (232)
Total delivered energy for all uses													4487.3685 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2255.9392	3.4800	78.5067 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1770.9604	3.4800	61.6294 (247)
Mechanical ventilation fans	39.4528	13.1900	5.2038 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	346.0160	13.1900	45.6395 (250)
Additional standing charges			120.0000 (251)
Total energy cost			320.8719 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.1399 (257)
SAP value		84.0989
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	2255.9392	0.2160	487.2829 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1770.9604	0.2160	382.5274 (264)
Space and water heating			869.8103 (265)
Pumps and fans	114.4528	0.5190	59.4010 (267)
Energy for lighting	346.0160	0.5190	179.5823 (268)
Total kg/year			1108.7936 (272)
CO2 emissions per m2			15.1400 (273)
EI value			87.4331
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	$3.48 / 0.8859 = 3.928$, stars = 4
Water heating environmental impact	$0.216 / 0.8859 = 0.2438$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.2300 (1b)	x 2.4000 (2b)	= 175.7520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 175.7520 (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					3.3100
Infiltration rate					0.1655 (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) =				0.1283 (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	0.1347	0.1283	0.1283	0.1186	0.1186	0.1058	0.1090	0.1026	0.1058	0.1122	0.1122	0.1218 (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)			10.2200	1.2357	12.6293		(27)
FT-03			73.2300	0.1300	9.5199		(28b)
WT-E-03	32.1100	10.2200	21.8900	0.1600	3.5024		(29a)
WT-I-02	21.8400	2.1200	19.7200	0.1584	3.1240		(29a)
Total net area of external elements Aum(A, m ²)				127.1800			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8956		(33)
Party Wall 1				17.7000	0.0000		(32)
Party Wall 2				17.7000	0.0000		(32)
Party Ceilings 1				73.2300			(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)
 15.0540 (36)
 (33) + (36) = 45.9496 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991	28.9991 (38)
Heat transfer coeff	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487	74.9487 (39)
Average = Sum(39)m / 12 =												74.9487 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235	1.0235 (40)
HLP (average)												1.0235 (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
 Average daily hot water use (litres/day)

2.3219 (42)
 89.3456 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2802	94.7063	91.1325	87.5587	83.9849	80.4110	80.4110	83.9849	87.5587	91.1325	94.7063	98.2802 (44)
Energy conte	145.7467	127.4710	131.5386	114.6785	110.0368	94.9534	87.9883	100.9678	102.1737	119.0736	129.9781	141.1478 (45)
Energy content (annual)												Total = Sum(45)m = 1405.7543 (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

	21.8620	19.1206	19.7308	17.2018	16.5055	14.2430	13.1982	15.1452	15.3261	17.8610	19.4967	21.1722 (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	14.1003	12.7150	14.0443	13.5538	13.9784	13.4960	13.9264	13.9601	13.5275	14.0170	13.6082	14.0895 (61)
Total heat required for water heating calculated for each month	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373 (64)
Heat gains from water heating, kWh/month	51.9858	45.5628	47.2477	41.5191	40.0818	34.9460	32.7377	37.0618	37.3546	43.0962	46.6198	50.4540 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1570.7708 (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	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152	139.3152 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.9821	43.5055	35.3811	26.7857	20.0227	16.9040	18.2653	23.7420	31.8664	40.4617	47.2248	50.3435 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.5452	308.7158	300.7260	283.7166	262.2454	242.0654	228.5839	225.4133	233.4031	250.4125	271.8838	292.0638 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534	51.2534 (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)	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768	-92.8768 (71)
Water heating gains (Table 5)	69.8734	67.8019	63.5049	57.6654	53.8734	48.5361	44.0023	49.8143	51.8814	57.9250	64.7497	67.8146 (72)
Total internal gains	525.0927	520.7150	500.3038	468.8596	436.8333	408.1973	391.5434	399.6614	417.8428	449.4911	484.5502	510.9137 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g	FF		Access		Gains
					W/m2		Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W
West				10.2200	22.3313		0.4500	0.0000		0.7700		79.0803 (80)
Solar gains	79.0803	139.1533	225.9604	338.6498	403.5155	441.7215	416.1196	366.0865	284.5456	176.2051	101.0154	64.4008 (83)
Total gains	604.1730	659.8683	726.2642	807.5094	840.3488	849.9189	807.6629	765.7479	702.3884	625.6962	585.5656	575.3145 (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	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408	27.1408
alpha	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094	2.8094
util living area	0.9209	0.8990	0.8470	0.7484	0.6041	0.4151	0.2814	0.3049	0.5459	0.7795	0.8885	0.9287 (86)
MIT	19.3790	19.5686	19.9688	20.4192	20.7654	20.9440	20.9871	20.9837	20.8692	20.4469	19.8415	19.3226 (87)
Th 2	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638	20.0638 (88)
util rest of house	0.9104	0.8857	0.8268	0.7156	0.5531	0.3452	0.1990	0.2191	0.4759	0.7425	0.8715	0.9190 (89)
MIT 2	18.6056	18.7892	19.1742	19.5946	19.8990	20.0353	20.0602	20.0589	19.9866	19.6307	19.0588	18.5512 (90)
Living area fraction	18.8776	19.0632	19.4536	19.8846	20.2036	20.3548	20.3861	20.3841	20.2969	19.9177	19.3341	18.8225 (92)
Temperature adjustment	18.7276	18.9132	19.3036	19.7346	20.0536	20.2048	20.2361	20.2341	20.1469	19.7677	19.1841	18.6725 (93)
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	538.8801	571.6793	586.8072	567.6682	464.3245	302.6484	173.2143	179.9519	338.8888	456.3657	499.0819	518.4225 (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	1021.3690	997.8079	892.1604	737.0891	528.6600	315.1474	175.0897	182.4326	370.7665	612.1590	838.2300	1017.2382 (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	358.9718	286.3584	227.1828	121.9831	47.8656	0.0000	0.0000	0.0000	0.0000	115.9102	244.1866	371.1188 (98)
Space heating												1773.5773 (98)
Space heating per m ²										(98) / (4) =		24.2193 (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													1959.7539 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	358.9718	286.3584	227.1828	121.9831	47.8656	0.0000	0.0000	0.0000	0.0000	115.9102	244.1866	371.1188	(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)	396.6539	316.4181	251.0307	134.7879	52.8902	0.0000	0.0000	0.0000	0.0000	128.0776	269.8194	410.0761	(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	159.8470	140.1860	145.5829	128.2323	124.0151	108.4494	101.9146	114.9279	115.7012	133.0906	143.5864	155.2373	(64)
Efficiency of water heater (217)m	89.4894	89.4227	89.2227	88.8313	88.1682	87.3000	87.3000	87.3000	87.3000	88.7610	89.2881	89.5321	(216)
Fuel for water heating, kWh/month	178.6212	156.7677	163.1679	144.3549	140.6575	124.2262	116.7407	131.6471	132.5329	149.9427	160.8124	173.3874	(219)
Water heating fuel used												1772.8586	(219)
Annual totals kWh/year													
Space heating fuel - main system												1959.7539	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.3360, total flow = 29.0000, SFP = 0.1840)													
mechanical ventilation fans (SFP = 0.1840)												39.4528	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												114.4528	(231)
Electricity for lighting (calculated in Appendix L)												346.0160	(232)
Total delivered energy for all uses												4193.0813	(238)

10a. Fuel costs - using BEDF prices (476)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1959.7539	3.8700	75.8425 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1772.8586	3.8700	68.6096 (247)
Mechanical ventilation fans	39.4528	18.9000	7.4566 (249)
Pumps and fans for heating	75.0000	18.9000	14.1750 (249)
Energy for lighting	346.0160	18.9000	65.3970 (250)
Additional standing charges			93.0000 (251)
Total energy cost			324.4807 (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	1959.7539	0.2160	423.3068 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1772.8586	0.2160	382.9375 (264)
Space and water heating			806.2443 (265)
Pumps and fans	114.4528	0.5190	59.4010 (267)
Energy for lighting	346.0160	0.5190	179.5823 (268)
Total kg/year			1045.2276 (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	1959.7539	1.2200	2390.8998 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1772.8586	1.2200	2162.8875 (264)
Space and water heating			4553.7872 (265)
Pumps and fans	114.4528	3.0700	351.3701 (267)
Energy for lighting	346.0160	3.0700	1062.2692 (268)
Primary energy kWh/year			5967.4265 (272)
Primary energy kWh/m2/year			81.4888 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
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 84	
Potential environmental impact rating:			B 87

Fuel prices for cost data on this page from database revision number 476 TEST (01 Apr 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	£87	£87	£0
Mains gas	£237	£237	£0
Space heating	£190	£190	£0
Water heating	£69	£69	£0
Lighting	£65	£65	£0
Total cost of fuels	£324	£324	£0
Total cost of uses	£324	£324	£0
Delivered energy	57 kWh/m²	57 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	81 kWh/m²	81 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	East
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	347.99 (P1)
Transmission heat loss coefficient	45.95 (37)
Summer heat loss coefficient	393.94 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
West	1.000	0.90	1.000 0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b
			FF Specific data or Table 6c
West	10.2200	117.5071	0.4500 0.0000
total:			0.9000 486.3735

	Jun	Jul	Aug	
Solar gains	516	486	428	(P4)
Internal gains	405	389	397	
Total summer gains	921	875	825	(P5)
Summer gain/loss ratio	2.34	2.22	2.09	(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	19.64	21.42	21.19	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			