

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW027a_058_As_Built				Issued on Date	17/09/2021
Assessment Reference	001	Prop Type Ref	MFF			
Property						
SAP Rating	84 B	DER	17.67	TER	19.78	
Environmental	87 B	% DER<TER	10.65			
CO ₂ Emissions (t/year)	1.13	DFEE	45.09	TFEE	55.93	
General Requirements Compliance	Pass	% DFEE<TFEE	19.38			
Assessor Details	Mr. Stephen Smith, Southern Energy Consultants Limited, Tel: 01635261582, info@southernenergyconsultants.co.uk				Assessor ID	d168-0001
Client	Bellway Homes Thames Valley					

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 74 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.78 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.67 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 45.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.27 (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: 4.04 (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: 3.80 m², No overhang
Windows facing East: 6.42 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K

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	74.2900 (1b)	x 2.4000 (2b)	= 178.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.2900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.0400
Infiltration rate					0.2020 (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) =				0.1566 (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	0.1996	0.1957	0.1918	0.1722	0.1683	0.1487	0.1487	0.1448	0.1566	0.1683	0.1761	0.1839 (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			74.2900	0.1300	9.6577		(28b)
WT-E-03	20.1600	10.2200	9.9400	0.1600	1.5904		(29a)
WT-I-02	47.0400	2.1200	44.9200	0.1584	7.1162		(29a)
WT-I-11	3.8400		3.8400	0.2719	1.0441		(29a)
Total net area of external elements Aum(A, m ²)					145.3300		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.1577	(33)
Party Wall 1				22.5600	0.0000	0.0000	(32)
Party Ceilings 1				74.2900			(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)							16.8548 (36)
Total fabric heat loss							(33) + (36) = 51.0125 (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	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188 (38)
Heat transfer coeff	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313 (39)
Average = Sum(39)m / 12 =												80.4313 (39)
HLP	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827 (40)
HLP (average)												1.0827 (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												2.3456 (42)
Average daily hot water use (litres/day)												89.9084 (43)
Daily hot water use	98.8993	95.3029	91.7066	88.1103	84.5139	80.9176	80.9176	84.5139	88.1103	91.7066	95.3029	98.8993 (44)
Energy conte	146.6648	128.2740	132.3672	115.4010	110.7300	95.5515	88.5426	101.6039	102.8173	119.8237	130.7969	142.0370 (45)
Energy content (annual)												Total = Sum(45)m = 1414.6099 (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 DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:	21.9997	19.2411	19.8551	17.3101	16.6095	14.3327	13.2814	15.2406	15.4226	17.9736	19.6195	21.3056 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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	14.1047	12.7187	14.0479	13.5568	13.9812	13.4984	13.9285	13.9626	13.5302	14.0203	13.6120	14.0937 (61)
Total heat required for water heating calculated for each month	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (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	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (64)
Heat gains from water heating, kWh/month	52.2922	45.8308	47.5241	41.7600	40.3130	35.1455	32.9225	37.2739	37.5693	43.3465	46.8930	50.7507 (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	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.8830	17.6599	14.3620	10.8730	8.1277	6.8617	7.4143	9.6374	12.9353	16.4244	19.1697	20.4356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.0958	209.2448	203.8294	192.3006	177.7476	164.0698	154.9321	152.7831	158.1986	169.7274	184.2804	197.9582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281 (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)	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247 (71)
Water heating gains (Table 5)	70.2852	68.2005	63.8764	58.0000	54.1841	48.8132	44.2507	50.0994	52.1796	58.2614	65.1291	68.2133 (72)
Total internal gains	358.4483	356.2896	343.2521	322.3579	301.2437	280.9289	267.7815	273.7042	284.4978	305.5974	329.7635	347.7915 (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				3.8000	10.6334	0.4500					0.7700	14.0010 (74)
East				6.4200	19.6403	0.4500					0.7700	43.6904 (76)
Solar gains	57.6913	112.2242	186.2190	278.3099	349.9563	362.8517	343.5105	288.6189	218.3664	133.2648	71.7488	47.6007 (83)
Total gains	416.1397	468.5138	529.4711	600.6678	651.2000	643.7807	611.2919	562.3231	502.8642	438.8621	401.5122	395.3922 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568 (85)
tau	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105
alpha	0.9708	0.9585	0.9322	0.8758	0.7789	0.6446	0.5151	0.5662	0.7654	0.9089	0.9592	0.9744 (86)
util living area	18.6874	18.9172	19.3436	19.8989	20.4071	20.7543	20.9040	20.8729	20.5812	19.9225	19.1954	18.6215 (87)
Th 2	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150 (88)
util rest of house	0.9664	0.9522	0.9216	0.8552	0.7401	0.5774	0.4195	0.4713	0.7099	0.8896	0.9519	0.9706 (89)
MIT 2	17.8930	18.1201	18.5399	19.0786	19.5550	19.8579	19.9701	19.9517	19.7226	19.1117	18.3984	17.8278 (90)
Living area fraction	18.2290	18.4572	18.8798	19.4256	19.9154	20.2370	20.3651	20.3413	20.0858	19.4546	18.7355	18.1635 (91)
MIT	18.0790	18.3072	18.7298	19.2756	19.7654	20.0870	20.2151	20.1913	19.9358	19.3046	18.5855	18.0135 (92)
Temperature adjustment												-0.1500
adjusted MIT												18.0135 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9549	0.9382	0.9042	0.8369	0.7291	0.5827	0.4401	0.4896	0.7049	0.8722	0.9381	0.9600 (94)
Ext temp.	397.3740	439.5374	478.7625	502.7137	474.7845	375.1464	269.0400	275.3070	354.4461	382.7718	376.6597	379.5683 (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	1108.2597	1078.3583	983.6590	834.5205	648.7123	441.3271	290.7648	304.9398	469.3776	700.1238	923.7914	1111.0389 (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	528.8990	429.2877	375.6430	238.9009	129.4023	0.0000	0.0000	0.0000	0.0000	236.1099	393.9348	544.2141 (98)
Space heating per m2												2876.3917 (98)
												(98) / (4) = 38.7184 (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													3178.3333 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	528.8990	429.2877	375.6430	238.9009	129.4023	0.0000	0.0000	0.0000	0.0000	236.1099	393.9348	544.2141	(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)	584.4188	474.3510	415.0752	263.9789	142.9860	0.0000	0.0000	0.0000	0.0000	260.8949	435.2871	601.3415	(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	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307	(64)
Efficiency of water heater (217)m	89.7333	89.6872	89.5791	89.3518	88.9007	87.3000	87.3000	87.3000	87.3000	89.3156	89.6188	87.3000	(216)
Fuel for water heating, kWh/month	179.1638	157.2048	163.4479	144.3259	140.2813	124.9140	117.3781	132.3786	133.2733	149.8552	161.1368	173.9299	(219)
Water heating fuel used												1777.2895	(219)
Annual totals kWh/year													
Space heating fuel - main system												3178.3333	(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)													40.0239 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													115.0239 (231)
Electricity for lighting (calculated in Appendix L)													351.1398 (232)
Total delivered energy for all uses													5421.7865 (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	3178.3333	0.2160	686.5200	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1777.2895	0.2160	383.8945	(264)
Space and water heating			1070.4145	(265)
Pumps and fans	115.0239	0.5190	59.6974	(267)
Energy for lighting	351.1398	0.5190	182.2416	(268)
Total CO2, kg/year			1312.3535	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.6700	(273)

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

DER			17.6700	ZC1
Total Floor Area		TFA	74.2900	
Assumed number of occupants		N	2.3456	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.5191	ZC2
CO2 emissions from cooking, equation (L16)			2.3596	ZC3
Total CO2 emissions			36.5487	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			36.5487	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	74.2900 (1b)	x 2.4000 (2b)	= 178.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.2900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1683 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4183 (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) =				0.3242 (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	0.4133	0.4052	0.3971	0.3566	0.3485	0.3079	0.3079	0.2998	0.3242	0.3485	0.3647	0.3809 (22b)
Effective ac	0.5854	0.5821	0.5788	0.5636	0.5607	0.5474	0.5474	0.5450	0.5525	0.5607	0.5665	0.5725 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492		(27)					
FT-03			74.2900	0.1300	9.6577		(28b)					
WT-E-03	20.1600	10.2200	9.9400	0.1800	1.7892		(29a)					
WT-I-02	47.0400	2.1200	44.9200	0.1800	8.0856		(29a)					
WT-I-11	3.8400		3.8400	0.1800	0.6912		(29a)					
Total net area of external elements Aum(A, m2)			145.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8929		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0015 (36)					
Total fabric heat loss						(33) + (36) =	50.8944 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.4439	Feb 34.2488	Mar 34.0575	Apr 33.1591	May 32.9911	Jun 32.2086	Jul 32.2086	Aug 32.0637	Sep 32.5100	Oct 32.9911	Nov 33.3311	Dec 33.6866 (38)
Heat transfer coeff	85.3383	85.1432	84.9519	84.0536	83.8855	83.1030	83.1030	82.9582	83.4044	83.8855	84.2255	84.5810 (39)
Average = Sum(39)m / 12 =												84.0528 (39)
HLP	Jan 1.1487	Feb 1.1461	Mar 1.1435	Apr 1.1314	May 1.1292	Jun 1.1186	Jul 1.1186	Aug 1.1167	Sep 1.1227	Oct 1.1292	Nov 1.1337	Dec 1.1385 (40)
HLP (average)												1.1314 (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												2.3456 (42)
Average daily hot water use (litres/day)												89.9084 (43)
Daily hot water use	98.8993	95.3029	91.7066	88.1103	84.5139	80.9176	80.9176	84.5139	88.1103	91.7066	95.3029	98.8993 (44)
Energy conte	146.6648	128.2740	132.3672	115.4010	110.7300	95.5515	88.5426	101.6039	102.8173	119.8237	130.7969	142.0370 (45)
Energy content (annual)										Total = Sum(45)m =		1414.6099 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.9997	19.2411	19.8551	17.3101	16.6095	14.3327	13.2814	15.2406	15.4226	17.9736	19.6195	21.3056 (46)
Total storage loss												
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.3980	43.8655	46.7327	43.4516	43.0674	39.9046	41.2347	43.0674	43.4516	46.7327	46.9987	50.3980 (61)
Solar input	197.0628	172.1394	179.0999	158.8526	153.7973	135.4561	129.7773	144.6712	146.2690	166.5564	177.7957	192.4350 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	197.0628	172.1394	179.0999	158.8526	153.7973	135.4561	129.7773	144.6712	146.2690	166.5564	177.7957	192.4350 (64)
	61.3655	53.6175	55.6953	49.2337	47.5846	41.7470	39.7491	44.5501	45.0497	51.5246	55.2397	59.8268 (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	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.8830	17.6599	14.3620	10.8730	8.1277	6.8617	7.4143	9.6374	12.9353	16.4244	19.1697	20.4356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.0958	209.2448	203.8294	192.3006	177.7476	164.0698	154.9321	152.7831	158.1986	169.7274	184.2804	197.9582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	(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)	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	(71)
Water heating gains (Table 5)	82.4806	79.7879	74.8592	68.3802	63.9577	57.9820	53.4262	59.8792	62.5690	69.2534	76.7218	80.4124	(72)
Total internal gains	370.6437	367.8769	354.2349	332.7380	311.0172	290.0977	276.9569	283.4840	294.8872	316.5894	341.3561	359.9905	(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					3.8000	10.6334	0.6300	0.7000			0.7700	12.3489
East					6.4200	19.6403	0.6300	0.7000			0.7700	38.5349 (76)
Solar gains	50.8838	98.9818	164.2451	245.4693	308.6615	320.0352	302.9762	254.5619	192.5992	117.5395	63.2824	41.9839 (83)
Total gains	421.5274	466.8587	518.4801	578.2073	619.6787	610.1330	579.9331	538.0459	487.4863	434.1290	404.6385	401.9743 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.4538	60.5924	60.7288	61.3778	61.5008	62.0799	62.0799	62.1883	61.8556	61.5008	61.2525	60.9951	
alpha	5.0303	5.0395	5.0486	5.0919	5.1001	5.1387	5.1387	5.1459	5.1237	5.1001	5.0835	5.0663	
util living area	0.9985	0.9971	0.9926	0.9749	0.9158	0.7747	0.6074	0.6692	0.8976	0.9855	0.9970	0.9988	(86)
MIT	19.7301	19.8547	20.0923	20.4249	20.7301	20.9248	20.9829	20.9726	20.8248	20.4358	20.0271	19.7085	(87)
Th 2	19.9612	19.9634	19.9655	19.9753	19.9771	19.9856	19.9856	19.9872	19.9823	19.9771	19.9734	19.9695	(88)
util rest of house	0.9979	0.9961	0.9899	0.9645	0.8797	0.6868	0.4790	0.5410	0.8394	0.9778	0.9958	0.9984	(89)
MIT 2	18.2651	18.4486	18.7963	19.2819	19.6998	19.9325	19.9790	19.9752	19.8308	19.3040	18.7081	18.2393	(90)
Living area fraction									fLA = Living area / (4) =			0.4229	(91)
MIT	18.8847	19.0433	19.3444	19.7653	20.1356	20.3522	20.4036	20.3970	20.2512	19.7827	19.2660	18.8607	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8847	19.0433	19.3444	19.7653	20.1356	20.3522	20.4036	20.3970	20.2512	19.7827	19.2660	18.8607	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	420.3236	464.4390	512.0514	556.1534	549.1465	439.9791	309.5752	320.4780	417.9216	423.6397	402.4552	401.0709	(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	1244.6344	1204.2061	1091.1591	913.2671	707.6215	478.0245	316.0915	331.5844	513.0367	770.2973	1024.6848	1240.0171	(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	613.2872	497.1235	430.8562	257.1219	117.9054	0.0000	0.0000	0.0000	0.0000	257.9133	448.0053	624.1760	(98)
Space heating												3246.3888	(98)
Space heating per m2												43.6989	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3475.7910 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	613.2872	497.1235	430.8562	257.1219	117.9054	0.0000	0.0000	0.0000	0.0000	257.9133	448.0053	624.1760	(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)	656.6245	532.2521	461.3021	275.2911	126.2370	0.0000	0.0000	0.0000	0.0000	276.1384	479.6631	668.2827	(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	197.0628	172.1394	179.0999	158.8526	153.7973	135.4561	129.7773	144.6712	146.2690	166.5564	177.7957	192.4350	(64)
Efficiency of water heater	87.7170	87.5671	87.1803	86.2569	84.3916	80.3000	80.3000	80.3000	80.3000	86.1483	87.2810	87.7977	(217)
Fuel for water heating, kWh/month	224.6575	196.5800	205.4363	184.1622	182.2425	168.6876	161.6155	180.1634	182.1532	193.3369	203.7048	219.1800	(219)
Water heating fuel used												2301.9200	(219)
Annual totals kWh/year													
Space heating fuel - main system												3475.7910	(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)												351.1398	(232)
Total delivered energy for all uses												6203.8508	(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	3475.7910	0.2160	750.7708 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2301.9200	0.2160	497.2147 (264)
Space and water heating			1247.9856 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	351.1398	0.5190	182.2416 (268)
Total CO2, kg/m2/year			1469.1521 (272)
Emissions per m2 for space and water heating			16.7988 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4531 (272b)
Emissions per m2 for pumps and fans			0.5240 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.7988 * 1.00) + 2.4531 + 0.5240, rounded to 2 d.p.			19.7800 (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	74.2900 (1b)	x 2.4000 (2b)	= 178.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.2900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2960 (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) = 0.1683 (8)
Measured/design AP50					Yes
Infiltration rate					4.0400
Number of sides sheltered					0.3703 (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) =				0.2870 (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	0.3659	0.3587	0.3515	0.3156	0.3085	0.2726	0.2726	0.2654	0.2870	0.3085	0.3228	0.3372 (22b)
	0.5669	0.5643	0.5618	0.5498	0.5476	0.5372	0.5372	0.5352	0.5412	0.5476	0.5521	0.5568 (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			74.2900	0.1300	9.6577		(28b)
WT-E-03	20.1600	10.2200	9.9400	0.1600	1.5904		(29a)
WT-I-02	47.0400	2.1200	44.9200	0.1584	7.1162		(29a)
WT-I-11	3.8400		3.8400	0.2719	1.0441		(29a)
Total net area of external elements Aum(A, m ²)			145.3300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1577		(33)
Party Wall 1			22.5600	0.0000	0.0000		(32)
Party Ceilings 1			74.2900				(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)							16.8548 (36)
Total fabric heat loss						(33) + (36) =	51.0125 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.3567	33.2038	33.0539	32.3499	32.2182	31.6050	31.6050	31.4915	31.8412	32.2182	32.4847	32.7632 (38)
Heat transfer coeff	84.3692	84.2163	84.0664	83.3624	83.2307	82.6175	82.6175	82.5040	82.8537	83.2307	83.4972	83.7757 (39)
Average = Sum(39)m / 12 =												83.3618 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1357	1.1336	1.1316	1.1221	1.1203	1.1121	1.1121	1.1106	1.1153	1.1203	1.1239	1.1277 (40)
HLP (average)												1.1221 (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												2.3456 (42)
Average daily hot water use (litres/day)												89.9084 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.8993	95.3029	91.7066	88.1103	84.5139	80.9176	80.9176	84.5139	88.1103	91.7066	95.3029	98.8993 (44)
Energy conte	146.6648	128.2740	132.3672	115.4010	110.7300	95.5515	88.5426	101.6039	102.8173	119.8237	130.7969	142.0370 (45)
Energy content (annual)										Total = Sum(45)m =		1414.6099 (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)
	31.1663	27.2582	28.1280	24.5227	23.5301	20.3047	18.8153	21.5908	21.8487	25.4625	27.7944	30.1829 (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	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.8830	17.6599	14.3620	10.8730	8.1277	6.8617	7.4143	9.6374	12.9353	16.4244	19.1697	20.4356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.0958	209.2448	203.8294	192.3006	177.7476	164.0698	154.9321	152.7831	158.1986	169.7274	184.2804	197.9582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281 (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)	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247 (71)
Water heating gains (Table 5)	41.8901	40.5628	37.8065	34.0593	31.6265	28.2010	25.2894	29.0199	30.3454	34.2238	38.6033	40.5684 (72)
Total internal gains	327.0533	325.6518	314.1822	295.4172	275.6860	257.3167	245.8201	249.6248	259.6636	278.5598	300.2376	317.1465 (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	3.8000				10.6334		0.4500		0.0000		0.7700		14.0010
East	6.4200				19.6403		0.4500		0.0000		0.7700		43.6904 (76)
Solar gains	57.6913	112.2242	186.2190	278.3099	349.9563	362.8517	343.5105	288.6189	218.3664	133.2648	71.7488	47.6007 (83)	
Total gains	384.7446	437.8761	500.4012	573.7270	625.6423	620.1685	589.3306	538.2437	478.0300	411.8246	371.9864	364.7472 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil _m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	24.4593	24.5037	24.5474	24.7547	24.7939	24.9779	24.9779	25.0123	24.9067	24.7939	24.7147	24.6326
alpha	2.6306	2.6336	2.6365	2.6503	2.6529	2.6652	2.6652	2.6675	2.6604	2.6529	2.6476	2.6422
util living area	0.9759	0.9649	0.9413	0.8892	0.7983	0.6670	0.5382	0.5918	0.7882	0.9218	0.9661	0.9789 (86)
MIT	18.5022	18.7426	19.1898	19.7894	20.3328	20.7195	20.8871	20.8513	20.5256	19.8191	19.0555	18.4543 (87)
Th 2	19.9718	19.9735	19.9751	19.9828	19.9842	19.9910	19.9910	19.9922	19.9884	19.9842	19.9813	19.9783 (88)
util rest of house	0.9721	0.9594	0.9317	0.8699	0.7605	0.5990	0.4386	0.4939	0.7342	0.9042	0.9598	0.9757 (89)
MIT 2	17.6801	17.9193	18.3618	18.9513	19.4650	19.8109	19.9382	19.9178	19.6551	18.9912	18.2377	17.6372 (90)
Living area fraction									fLA = Living area / (4) =			0.4229 (91)
MIT	18.0278	18.2675	18.7120	19.3058	19.8320	20.1951	20.3395	20.3126	20.0232	19.3414	18.5836	17.9828 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0278	18.2675	18.7120	19.3058	19.8320	20.1951	20.3395	20.3126	20.0232	19.3414	18.5836	17.9828 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9625	0.9475	0.9168	0.8547	0.7541	0.6139	0.4750	0.5272	0.7363	0.8904	0.9485	0.9669 (94)
Ext temp.	370.3302	414.8784	458.7807	490.3413	471.8280	380.6962	279.9413	283.7828	351.9694	366.6893	352.8219	352.6860 (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	1158.2041	1125.7615	1026.6207	867.4508	676.8354	462.2565	308.9498	322.8027	490.7632	727.5505	958.8457	1154.6618 (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	586.1782	477.7135	422.4729	271.5189	152.5255	0.0000	0.0000	0.0000	0.0000	268.4808	436.3371	596.6700 (98)
Space heating per m ²										(98) / (4) =		43.2346 (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	776.6047	611.3697	627.0302	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7435	0.8067	0.7740	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	577.3716	493.2108	485.3306	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.6796	774.9046	716.8265	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	169.4218	209.5802	172.2329	0.0000	0.0000	0.0000	0.0000 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												551.2349 (104)
Cooled Fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	42.3554	52.3951	43.0582	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												137.8087 (107)
Space cooling per m2												1.8550 (108)
Energy for space heating												43.2346 (99)
Energy for space cooling												1.8550 (108)
Total												45.0896 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.2900 (1b)	x 2.4000 (2b)	= 178.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.2900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2960 (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 30.0000 / (5) = 0.1683 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4183 (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) =	0.3242 (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	0.4133	0.4052	0.3971	0.3566	0.3485	0.3079	0.3079	0.2998	0.3242	0.3485	0.3647	0.3809 (22b)
	0.5854	0.5821	0.5788	0.5636	0.5607	0.5474	0.5474	0.5450	0.5525	0.5607	0.5665	0.5725 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.1200	1.0000	2.1200			(26)					
TER Opening Type (Uw = 1.40)			10.2200	1.3258	13.5492			(27)					
FT-03			74.2900	0.1300	9.6577			(28b)					
WT-E-03	20.1600	10.2200	9.9400	0.1800	1.7892			(29a)					
WT-I-02	47.0400	2.1200	44.9200	0.1800	8.0856			(29a)					
WT-I-11	3.8400		3.8400	0.1800	0.6912			(29a)					
Total net area of external elements Aum(A, m2)			145.3300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.8929			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.0015 (36)					
Total fabric heat loss						(33) + (36) =		50.8944 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.4439	Feb 34.2488	Mar 34.0575	Apr 33.1591	May 32.9911	Jun 32.2086	Jul 32.2086	Aug 32.0637	Sep 32.5100	Oct 32.9911	Nov 33.3311	Dec 33.6866	(38)
Heat transfer coeff	85.3383	85.1432	84.9519	84.0536	83.8855	83.1030	83.1030	82.9582	83.4044	83.8855	84.2255	84.5810	(39)
Average = Sum(39)m / 12 =												84.0528	(39)
HLP	Jan 1.1487	Feb 1.1461	Mar 1.1435	Apr 1.1314	May 1.1292	Jun 1.1186	Jul 1.1186	Aug 1.1167	Sep 1.1227	Oct 1.1292	Nov 1.1337	Dec 1.1385	(40)
HLP (average)												1.1314	(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												2.3456 (42)
Average daily hot water use (litres/day)												89.9084 (43)
Daily hot water use	98.8993	95.3029	91.7066	88.1103	84.5139	80.9176	80.9176	84.5139	88.1103	91.7066	95.3029	98.8993 (44)
Energy conte	146.6648	128.2740	132.3672	115.4010	110.7300	95.5515	88.5426	101.6039	102.8173	119.8237	130.7969	142.0370 (45)
Energy content (annual)										Total = Sum(45)m =		1414.6099 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	31.1663	27.2582	28.1280	24.5227	23.5301	20.3047	18.8153	21.5908	21.8487	25.4625	27.7944	30.1829 (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	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809	117.2809 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.8830	17.6599	14.3620	10.8730	8.1277	6.8617	7.4143	9.6374	12.9353	16.4244	19.1697	20.4356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.0958	209.2448	203.8294	192.3006	177.7476	164.0698	154.9321	152.7831	158.1986	169.7274	184.2804	197.9582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281	34.7281 (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)	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247 (71)
Water heating gains (Table 5)	41.8901	40.5628	37.8065	34.0593	31.6265	28.2010	25.2894	29.0199	30.3454	34.2238	38.6033	40.5684 (72)
Total internal gains	327.0533	325.6518	314.1822	295.4172	275.6860	257.3167	245.8201	249.6248	259.6636	278.5598	300.2376	317.1465 (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				3.8000	10.6334			0.6300	0.7000		0.7700	12.3489 (74)
East				6.4200	19.6403			0.6300	0.7000		0.7700	38.5349 (76)
Solar gains	50.8838	98.9818	164.2451	245.4693	308.6615	320.0352	302.9762	254.5619	192.5992	117.5395	63.2824	41.9839 (83)
Total gains	377.9370	424.6336	478.4273	540.8865	584.3475	577.3520	548.7963	504.1866	452.2627	396.0994	363.5200	359.1303 (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	60.4538	60.5924	60.7288	61.3778	61.5008	62.0799	62.0799	62.1883	61.8556	61.5008	61.2525	60.9951
alpha	5.0303	5.0395	5.0486	5.0919	5.1001	5.1387	5.1387	5.1459	5.1237	5.1001	5.0835	5.0663
util living area	0.9991	0.9981	0.9948	0.9808	0.9306	0.8009	0.6362	0.7033	0.9192	0.9902	0.9982	0.9993 (86)
MIT	19.6754	19.8020	20.0433	20.3828	20.7001	20.9117	20.9790	20.9657	20.7970	20.3906	19.9757	19.6545 (87)
Th 2	19.9612	19.9634	19.9655	19.9753	19.9771	19.9856	19.9856	19.9872	19.9823	19.9771	19.9734	19.9695 (88)
util rest of house	0.9988	0.9974	0.9928	0.9726	0.8990	0.7156	0.5045	0.5735	0.8688	0.9848	0.9974	0.9991 (89)
MIT 2	18.7486	18.8767	19.1188	19.4617	19.7626	19.9419	19.9799	19.9765	19.8582	19.4739	19.0583	18.7343 (90)
Living area fraction	19.1405	19.2680	19.5098	19.8513	20.1591	20.3521	20.4025	20.3949	20.2553	19.8616	19.4463	19.1235 (92)
MIT	19.1405	19.2680	19.5098	19.8513	20.1591	20.3521	20.4025	20.3949	20.2553	19.8616	19.4463	19.1235 (93)
Temperature adjustment												0.0000
adjusted MIT	19.1405	19.2680	19.5098	19.8513	20.1591	20.3521	20.4025	20.3949	20.2553	19.8616	19.4463	19.1235 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9984	0.9968	0.9917	0.9714	0.9056	0.7493	0.5610	0.6292	0.8848	0.9840	0.9969	0.9988 (94)
Ext temp.	377.3316	423.2915	474.4423	525.3983	529.1594	432.5907	307.8635	317.2230	400.1671	389.7429	362.3874	358.6894 (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	1266.4677	1223.3402	1105.2102	920.4948	709.5966	478.0148	315.9971	331.4068	513.3771	776.9147	1039.8741	1262.2455 (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	661.5172	537.6327	469.2913	284.4695	134.2453	0.0000	0.0000	0.0000	0.0000	288.0558	487.7904	672.2458 (98)
Space heating per m2												3535.2480 (98)
										(98) / (4) =		47.5871 (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	781.1687	614.9626	630.4819	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8269	0.8987	0.8656	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	645.9356	552.6428	545.7316	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	762.6344	727.5269	677.0196	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	84.0231	130.1138	97.6782	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												311.8151 (104)
Cooled fraction												1.0000 (105)
												fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	21.0058	32.5285	24.4196	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											77.9538 (107)
Space cooling per m2											1.0493 (108)
Energy for space heating											47.5871 (99)
Energy for space cooling											1.0493 (108)
Total											48.6364 (109)
Target Fabric Energy Efficiency (TFEE)											55.9 (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	74.2900 (1b)	x 2.4000 (2b)	= 178.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.2900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.0400
Infiltration rate					0.2020 (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) =		0.1566 (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	0.1644	0.1566	0.1566	0.1448	0.1448	0.1292	0.1331	0.1252	0.1292	0.1370	0.1370	0.1487 (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			74.2900	0.1300	9.6577		(28b)
WT-E-03	20.1600	10.2200	9.9400	0.1600	1.5904		(29a)
WT-I-02	47.0400	2.1200	44.9200	0.1584	7.1162		(29a)
WT-I-11	3.8400		3.8400	0.2719	1.0441		(29a)
Total net area of external elements Aum(A, m ²)			145.3300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1577		(33)
Party Wall 1			22.5600	0.0000	0.0000		(32)
Party Ceilings 1			74.2900				(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)							16.8548 (36)
Total fabric heat loss						(33) + (36) =	51.0125 (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	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188 (38)
Heat transfer coeff	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313 (39)
Average = Sum(39)m / 12 =												80.4313 (39)
HLP	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827 (40)
HLP (average)												1.0827 (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												2.3456 (42)
Average daily hot water use (litres/day)												89.9084 (43)
Daily hot water use	98.8993	95.3029	91.7066	88.1103	84.5139	80.9176	80.9176	84.5139	88.1103	91.7066	95.3029	98.8993 (44)
Energy conte	146.6648	128.2740	132.3672	115.4010	110.7300	95.5515	88.5426	101.6039	102.8173	119.8237	130.7969	142.0370 (45)
Energy content (annual)										Total = Sum(45)m =		1414.6099 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	21.9997	19.2411	19.8551	17.3101	16.6095	14.3327	13.2814	15.2406	15.4226	17.9736	19.6195	21.3056 (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	14.1047	12.7187	14.0479	13.5568	13.9812	13.4984	13.9285	13.9626	13.5302	14.0203	13.6120	14.0937 (61)
Total heat required for water heating calculated for each month	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (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	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (64)
								Total per year (kWh/year) = Sum(64)m =				1579.6648 (64)
RHI water heating demand												1580 (64)
Heat gains from water heating, kWh/month	52.2922	45.8308	47.5241	41.7600	40.3130	35.1455	32.9225	37.2739	37.5693	43.3465	46.8930	50.7507 (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	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.7075	44.1497	35.9050	27.1824	20.3191	17.1543	18.5358	24.0935	32.3383	41.0609	47.9241	51.0890	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.0983	312.3057	304.2230	287.0158	265.2949	244.8802	231.2420	228.0345	236.1173	253.3244	275.0454	295.4600	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	(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)	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	(71)
Water heating gains (Table 5)	70.2852	68.2005	63.8764	58.0000	54.1841	48.8132	44.2507	50.0994	52.1796	58.2614	65.1291	68.2133	(72)
Total internal gains	530.4227	525.9877	505.3361	473.5300	441.1299	412.1794	395.3602	403.5592	421.9669	453.9784	489.4304	516.0941	(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					3.8000	11.9814	0.4500	0.0000	0.7700		15.7760 (74)	
East					6.4200	22.3313	0.4500	0.0000	0.7700		49.6767 (76)	

Solar gains	65.4526	114.7835	188.3585	289.8972	354.6058	393.1292	368.2945	316.8837	239.3972	145.6257	83.4450	53.4477 (83)
Total gains	595.8753	640.7713	693.6947	763.4272	795.7357	805.3086	763.6547	720.4429	661.3641	599.6041	572.8754	569.5418 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	
alpha	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	
util living area	0.9284	0.9114	0.8695	0.7848	0.6491	0.4582	0.3158	0.3428	0.5942	0.8087	0.9009	0.9348	(86)
MIT	19.2132	19.3881	19.7917	20.2770	20.6874	20.9183	20.9798	20.9744	20.8190	20.3323	19.6961	19.1621	(87)
Th 2	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	(88)
util rest of house	0.9184	0.8992	0.8507	0.7533	0.5963	0.3801	0.2198	0.2430	0.5196	0.7731	0.8847	0.9256	(89)
MIT 2	18.4086	18.5789	18.9698	19.4278	19.7942	19.9736	20.0094	20.0075	19.9076	19.4898	18.8835	18.3592	(90)
Living area fraction									fLA = Living area / (4) =				0.4229 (91)
MIT	18.7489	18.9211	19.3174	19.7869	20.1719	20.3732	20.4198	20.4164	20.2931	19.8461	19.2272	18.6987	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5989	18.7711	19.1674	19.6369	20.0219	20.2232	20.2698	20.2664	20.1431	19.6961	19.0772	18.5487	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	536.6035	564.0895	577.0603	564.7380	474.8525	319.9489	187.2649	193.9822	350.5424	455.6260	496.1947	517.3124	(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	1085.7361	1059.3721	946.4675	783.1550	564.7834	339.6737	190.6085	198.3789	397.5793	651.1829	890.9535	1081.6995	(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	408.5547	332.8299	274.8389	157.2602	66.9086	0.0000	0.0000	0.0000	0.0000	145.4943	284.2263	419.9040	(98)
Space heating												2090.0169	(98)
RHI space heating demand												2090	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.2900 (1b)	x 2.4000 (2b)	= 178.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.2900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.0400
Infiltration rate					0.2020 (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) =				0.1566 (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	0.1996	0.1957	0.1918	0.1722	0.1683	0.1487	0.1487	0.1448	0.1566	0.1683	0.1761	0.1839 (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			74.2900	0.1300	9.6577		(28b)
WT-E-03	20.1600	10.2200	9.9400	0.1600	1.5904		(29a)
WT-I-02	47.0400	2.1200	44.9200	0.1584	7.1162		(29a)
WT-I-11	3.8400		3.8400	0.2719	1.0441		(29a)
Total net area of external elements Aum(A, m ²)			145.3300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1577		(33)
Party Wall 1			22.5600	0.0000	0.0000		(32)
Party Ceilings 1			74.2900				(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)							16.8548 (36)
Total fabric heat loss							(33) + (36) = 51.0125 (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	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188 (38)
Heat transfer coeff	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313 (39)
Average = Sum(39)m / 12 =												80.4313 (39)
HLP	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827 (40)
HLP (average)												1.0827 (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												2.3456 (42)
Average daily hot water use (litres/day)												89.9084 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	98.8993	95.3029	91.7066	88.1103	84.5139	80.9176	80.9176	84.5139	88.1103	91.7066	95.3029	98.8993 (44)
Energy conte	146.6648	128.2740	132.3672	115.4010	110.7300	95.5515	88.5426	101.6039	102.8173	119.8237	130.7969	142.0370 (45)
Energy content (annual)												Total = Sum(45)m = 1414.6099 (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

	21.9997	19.2411	19.8551	17.3101	16.6095	14.3327	13.2814	15.2406	15.4226	17.9736	19.6195	21.3056 (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	14.1047	12.7187	14.0479	13.5568	13.9812	13.4984	13.9285	13.9626	13.5302	14.0203	13.6120	14.0937 (61)
Total heat required for water heating calculated for each month	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (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	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (64)
Heat gains from water heating, kWh/month	52.2922	45.8308	47.5241	41.7600	40.3130	35.1455	32.9225	37.2739	37.5693	43.3465	46.8930	50.7507 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	49.7075	44.1497	35.9050	27.1824	20.3191	17.1543	18.5358	24.0935	32.3383	41.0609	47.9241	51.0890 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	309.0983	312.3057	304.2230	287.0158	265.2949	244.8802	231.2420	228.0345	236.1173	253.3244	275.0454	295.4600 (68)
Pumps, fans	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247 (71)
Total internal gains	70.2852	68.2005	63.8764	58.0000	54.1841	48.8132	44.2507	50.0994	52.1796	58.2614	65.1291	68.2133 (72)
	530.4227	525.9877	505.3361	473.5300	441.1299	412.1794	395.3602	403.5592	421.9669	453.9784	489.4304	516.0941 (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					3.8000	10.6334	0.4500	0.0000	0.7700		14.0010 (74)	
East					6.4200	19.6403	0.4500	0.0000	0.7700		43.6904 (76)	
Solar gains	57.6913	112.2242	186.2190	278.3099	349.9563	362.8517	343.5105	288.6189	218.3664	133.2648	71.7488	47.6007 (83)
Total gains	588.1140	638.2119	691.5551	751.8399	791.0862	775.0311	738.8707	692.1781	640.3333	587.2432	561.1791	563.6948 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	
alpha	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	
util living area	0.9371	0.9197	0.8847	0.8166	0.7097	0.5700	0.4427	0.4840	0.6764	0.8437	0.9166	0.9433 (86)	
MIT	19.0497	19.2567	19.6348	20.1154	20.5406	20.8202	20.9340	20.9139	20.6999	20.1603	19.5138	18.9821 (87)	
Th 2	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150 (88)	
util rest of house	0.9286	0.9088	0.8687	0.7902	0.6666	0.5034	0.3554	0.3959	0.6152	0.8155	0.9035	0.9355 (89)	
MIT 2	18.2474	18.4497	18.8176	19.2766	19.6668	19.9033	19.9852	19.9738	19.8135	19.3295	18.7057	18.1814 (90)	
Living area fraction										fLA = Living area / (4) =	0.4229 (91)		
MIT	18.5867	18.7910	19.1632	19.6314	20.0364	20.2911	20.3865	20.3714	20.1884	19.6809	19.0475	18.5200 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.4367	18.6410	19.0132	19.4814	19.8864	20.1411	20.2365	20.2214	20.0384	19.5309	18.8975	18.3700 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9115	0.8903	0.8494	0.7740	0.6605	0.5125	0.3758	0.4153	0.6168	0.7993	0.8853	0.9191 (94)
Useful gains	536.0531	568.2107	587.4301	581.9427	522.5099	397.1836	277.6748	287.4566	394.9375	469.3544	496.7872	518.0856 (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												
	1137.0369	1105.2089	1006.4569	851.0738	658.4409	445.6799	292.4849	307.3619	477.6335	718.3245	948.8874	1139.7145 (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												
	447.1319	360.8628	311.7560	193.7744	101.1327	0.0000	0.0000	0.0000	0.0000	185.2338	325.5121	462.4919 (98)
Space heating												2387.8955 (98)
Space heating per m2												(98) / (4) = 32.1429 (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													2638.5585 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	447.1319	360.8628	311.7560	193.7744	101.1327	0.0000	0.0000	0.0000	0.0000	185.2338	325.5121	462.4919	(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)	494.0684	398.7434	344.4817	214.1153	111.7488	0.0000	0.0000	0.0000	0.0000	204.6782	359.6819	511.0407	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307	(64)
Efficiency of water heater (217)m	89.6311	89.5775	89.4522	89.1936	88.7045	87.3000	87.3000	87.3000	87.3000	89.1296	89.4919	87.3000	(216)
Fuel for water heating, kWh/month	179.3679	157.3973	163.6798	144.5819	140.5916	124.9140	117.3781	132.3786	133.2733	150.1679	161.3653	174.1161	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2638.5585 (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)													40.0239 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													115.0239 (231)
Electricity for lighting (calculated in Appendix L)													351.1398 (232)
Total delivered energy for all uses													4883.9340 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2638.5585	3.4800	91.8218 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1779.2118	3.4800	61.9166 (247)
Mechanical ventilation fans	40.0239	13.1900	5.2792 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	351.1398	13.1900	46.3153 (250)
Additional standing charges			120.0000 (251)
Total energy cost			335.2254 (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] =	1.1803 (257)
SAP value		83.5352
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	2638.5585	0.2160	569.9286 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1779.2118	0.2160	384.3097 (264)
Space and water heating			954.2384 (265)
Pumps and fans	115.0239	0.5190	59.6974 (267)
Energy for lighting	351.1398	0.5190	182.2416 (268)
Total kg/year			1196.1774 (272)
CO2 emissions per m2			16.1000 (273)
EI value			86.5632
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	$3.48 / 0.8867 = 3.925$, stars = 4
Water heating environmental impact	$0.216 / 0.8867 = 0.2436$, 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	74.2900 (1b)	x 2.4000 (2b)	= 178.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.2900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2960 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.0400					
Infiltration rate							0.2020		(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) =	0.1566	(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	0.1644	0.1566	0.1566	0.1448	0.1448	0.1292	0.1331	0.1252	0.1292	0.1370	0.1370	0.1487 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			2.1200	1.0000	2.1200		(26)
Opening Type 2 (Uw = 1.30)			10.2200	1.2357	12.6293		(27)
FT-03			74.2900	0.1300	9.6577		(28b)
WT-E-03	20.1600	10.2200	9.9400	0.1600	1.5904		(29a)
WT-I-02	47.0400	2.1200	44.9200	0.1584	7.1162		(29a)
WT-I-11	3.8400		3.8400	0.2719	1.0441		(29a)
Total net area of external elements Aum(A, m ²)			145.3300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1577		(33)
Party Wall 1			22.5600	0.0000	0.0000		(32)
Party Ceilings 1			74.2900				(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)							16.8548 (36)
Total fabric heat loss							(33) + (36) = 51.0125 (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	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188	29.4188 (38)
Heat transfer coeff	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313	80.4313 (39)
Average = Sum(39)m / 12 =												80.4313 (39)
HLP	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827	1.0827 (40)
HLP (average)												1.0827 (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												2.3456 (42)
Average daily hot water use (litres/day)												89.9084 (43)
Daily hot water use	Jan 98.8993	Feb 95.3029	Mar 91.7066	Apr 88.1103	May 84.5139	Jun 80.9176	Jul 80.9176	Aug 84.5139	Sep 88.1103	Oct 91.7066	Nov 95.3029	Dec 98.8993 (44)
Energy conte	146.6648	128.2740	132.3672	115.4010	110.7300	95.5515	88.5426	101.6039	102.8173	119.8237	130.7969	142.0370 (45)
Energy content (annual)												Total = Sum(45)m = 1414.6099 (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

Water storage loss:	21.9997	19.2411	19.8551	17.3101	16.6095	14.3327	13.2814	15.2406	15.4226	17.9736	19.6195	21.3056 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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	14.1047	12.7187	14.0479	13.5568	13.9812	13.4984	13.9285	13.9626	13.5302	14.0203	13.6120	14.0937 (61)
Total heat required for water heating calculated for each month	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (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	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307 (64)
Heat gains from water heating, kWh/month	52.2922	45.8308	47.5241	41.7600	40.3130	35.1455	32.9225	37.2739	37.5693	43.3465	46.8930	50.7507 (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	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371	140.7371 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	49.7075	44.1497	35.9050	27.1824	20.3191	17.1543	18.5358	24.0935	32.3383	41.0609	47.9241	51.0890 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	309.0983	312.3057	304.2230	287.0158	265.2949	244.8802	231.2420	228.0345	236.1173	253.3244	275.0454	295.4600 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193	51.4193 (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)	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247	-93.8247 (71)
Water heating gains (Table 5)	70.2852	68.2005	63.8764	58.0000	54.1841	48.8132	44.2507	50.0994	52.1796	58.2614	65.1291	68.2133 (72)
Total internal gains	530.4227	525.9877	505.3361	473.5300	441.1299	412.1794	395.3602	403.5592	421.9669	453.9784	489.4304	516.0941 (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					3.8000	11.9814	0.4500	0.0000			0.7700	15.7760 (74)
East					6.4200	22.3313	0.4500	0.0000			0.7700	49.6767 (76)

Solar gains	65.4526	114.7835	188.3585	289.8972	354.6058	393.1292	368.2945	316.8837	239.3972	145.6257	83.4450	53.4477 (83)
Total gains	595.8753	640.7713	693.6947	763.4272	795.7357	805.3086	763.6547	720.4429	661.3641	599.6041	572.8754	569.5418 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9284	0.9114	0.8695	0.7848	0.6491	0.4582	0.3158	0.3428	0.5942	0.8087	0.9009	0.9348 (86)
tau	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568	25.6568 (87)
alpha	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105	2.7105 (88)
util living area	0.9284	0.9114	0.8695	0.7848	0.6491	0.4582	0.3158	0.3428	0.5942	0.8087	0.9009	0.9348 (86)
MIT	19.2132	19.3881	19.7917	20.2770	20.6874	20.9183	20.9798	20.9744	20.8190	20.3323	19.6961	19.1621 (87)
Th 2	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150	20.0150 (88)
util rest of house	0.9184	0.8992	0.8507	0.7533	0.5963	0.3801	0.2198	0.2430	0.5196	0.7731	0.8847	0.9256 (89)
MIT 2	18.4086	18.5789	18.9698	19.4278	19.7942	19.9736	20.0094	20.0075	19.9076	19.4898	18.8835	18.3592 (90)
Living area fraction	18.7489	18.9211	19.3174	19.7869	20.1719	20.3732	20.4198	20.4164	20.2931	19.8461	19.2272	18.6987 (91)
MIT	18.7489	18.9211	19.3174	19.7869	20.1719	20.3732	20.4198	20.4164	20.2931	19.8461	19.2272	18.6987 (92)
Temperature adjustment	18.5989	18.7711	19.1674	19.6369	20.0219	20.2232	20.2698	20.2664	20.1431	19.6961	19.0772	18.5487 (93)
adjusted MIT	18.5989	18.7711	19.1674	19.6369	20.0219	20.2232	20.2698	20.2664	20.1431	19.6961	19.0772	18.5487 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	536.6035	564.0895	577.0603	564.7380	474.8525	319.9489	187.2649	193.9822	350.5424	455.6260	496.1947	517.3124 (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	1085.7361	1059.3721	946.4675	783.1550	564.7834	339.6737	190.6085	198.3789	397.5793	651.1829	890.9535	1081.6995 (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	408.5547	332.8299	274.8389	157.2602	66.9086	0.0000	0.0000	0.0000	0.0000	145.4943	284.2263	419.9040 (98)
Space heating												2090.0169 (98)
Space heating per m2												28.1332 (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													2309.4110 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	408.5547	332.8299	274.8389	157.2602	66.9086	0.0000	0.0000	0.0000	0.0000	145.4943	284.2263	419.9040	(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)	451.4416	367.7678	303.6894	173.7682	73.9322	0.0000	0.0000	0.0000	0.0000	160.7672	314.0622	463.9823	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	160.7695	140.9926	146.4151	128.9578	124.7111	109.0499	102.4711	115.5665	116.3476	133.8440	144.4089	156.1307	(64)
Efficiency of water heater (217)m	89.5728	89.5235	89.3615	89.0296	88.3913	87.3000	87.3000	87.3000	87.3000	88.9380	89.3960	87.3000	(216)
Fuel for water heating, kWh/month	179.4846	157.4922	163.8458	144.8481	141.0898	124.9140	117.3781	132.3786	133.2733	150.4914	161.5384	174.2341	(219)
Water heating fuel used												1780.9685	(219)
Annual totals kWh/year													
Space heating fuel - main system												2309.4110	(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)													40.0239 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													115.0239 (231)
Electricity for lighting (calculated in Appendix L)													351.1398 (232)
Total delivered energy for all uses													4556.5432 (238)

10a. Fuel costs - using BEDF prices (482)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2309.4110	3.7400	86.3720 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1780.9685	3.7400	66.6082 (247)
Mechanical ventilation fans	40.0239	19.1200	7.6526 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	351.1398	19.1200	67.1379 (250)
Additional standing charges			94.0000 (251)
Total energy cost			336.1107 (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	2309.4110	0.2160	498.8328 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1780.9685	0.2160	384.6892 (264)
Space and water heating			883.5220 (265)
Pumps and fans	115.0239	0.5190	59.6974 (267)
Energy for lighting	351.1398	0.5190	182.2416 (268)
Total kg/year			1125.4609 (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	2309.4110	1.2200	2817.4814 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1780.9685	1.2200	2172.7816 (264)
Space and water heating			4990.2630 (265)
Pumps and fans	115.0239	3.0700	353.1233 (267)
Energy for lighting	351.1398	3.0700	1077.9993 (268)
Primary energy kWh/year			6421.3856 (272)
Primary energy kWh/m2/year			86.4367 (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 482 TEST (31 Aug 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	£89	£89	£0
Mains gas	£247	£247	£0
Space heating	£202	£202	£0
Water heating	£67	£67	£0
Lighting	£67	£67	£0
Total cost of fuels	£336	£336	£0
Total cost of uses	£336	£336	£0
Delivered energy	61 kWh/m²	61 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	86 kWh/m²	86 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 West
 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 353.03 (P1)
 Transmission heat loss coefficient 51.01 (37)
 Summer heat loss coefficient 404.04 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North	0.000	1.000	None
East	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)
East	1.000	0.90	1.000 0.900 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b
North	3.8000	81.1852	0.4500
East	6.4200	117.5071	0.4500
total:			430.4741

	Jun	Jul	Aug	
Solar gains	460	430	370	(P4)
Internal gains	409	392	401	
Total summer gains	869	823	771	(P5)
Summer gain/loss ratio	2.15	2.04	1.91	(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	19.45	21.24	21.01	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			