

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	SECPMW025r_126_As_Built				Issued on Date	03/12/2021
Assessment Reference	001	Prop Type Ref	TFF			
Property						
SAP Rating	83 B	DER	19.03	TER	19.57	
Environmental	86 B	% DER<TER	2.76			
CO ₂ Emissions (t/year)	1.10	DFEE	49.62	TFEE	53.77	
General Requirements Compliance	Pass	% DFEE<TFEE	7.72			
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

Top-floor flat, total floor area 70 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) 19.57 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.03 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 49.6 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.29 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.24 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.13 (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 East: 9.04 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.1 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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (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					3.1300
Infiltration rate					0.1565 (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) =				0.1213 (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	0.1546	0.1516	0.1486	0.1334	0.1304	0.1152	0.1152	0.1122	0.1213	0.1304	0.1364	0.1425 (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)			9.0400	1.2357	11.1711		(27)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Flat Roof	70.2400		70.2400	0.1500	10.5360		(30)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	40.0101	(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Floor 1			70.2400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9770 (36)
Total fabric heat loss							(33) + (36) = 53.9871 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021 (39)
Average = Sum(39)m / 12 =												81.8021 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646 (40)
HLP (average)												1.1646 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (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

	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
Heat gains from water heating, kWh/month	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597 (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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775 (71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370 (72)
Total internal gains	345.5702	343.4351	330.8470	310.7192	290.4325	270.8998	258.2562	264.0621	274.4619	294.7900	318.0529	335.3555 (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	
-----					-----	-----	-----	-----			-----	-----	
East					9.0400	19.6403	0.4500	0.0000			0.7700	61.5204 (76)	
-----					-----	-----	-----	-----			-----	-----	
Solar gains	61.5204	120.3469	198.1942	289.0544	354.2471	362.6349	345.2432	296.5588	230.5081	142.8017	76.7087	50.5914 (83)	
Total gains	407.0906	463.7820	529.0413	599.7736	644.6796	633.5347	603.4994	560.6209	504.9700	437.5918	394.7616	385.9469 (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	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290
alpha	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753
util living area	0.9983	0.9964	0.9899	0.9657	0.8934	0.7447	0.5771	0.6378	0.8754	0.9819	0.9966	0.9987 (86)
MIT	19.7202	19.8600	20.1167	20.4524	20.7536	20.9310	20.9845	20.9750	20.8368	20.4385	20.0084	19.6814 (87)
Th 2	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484 (88)
util rest of house	0.9977	0.9951	0.9862	0.9521	0.8510	0.6526	0.4490	0.5081	0.8094	0.9724	0.9952	0.9983 (89)
MIT 2	18.7830	18.9223	19.1772	19.5047	19.7803	19.9163	19.9445	19.9412	19.8555	19.4961	19.0707	18.7443 (90)
Living area fraction	19.0806	19.2200	19.4754	19.8056	20.0893	20.2384	20.2747	20.2694	20.1670	19.7953	19.3684	19.0418 (92)
Temperature adjustment	18.9306	19.0700	19.3254	19.6556	19.9393	20.0884	20.1247	20.1194	20.0170	19.6453	19.2184	18.8918 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	405.8324	460.8515	520.1965	568.2033	548.3608	421.9340	284.4605	297.4292	411.3109	423.8935	392.3178	385.0255 (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	1196.8122	1159.1366	1049.1486	879.8319	673.9900	448.9656	288.3242	304.2567	484.0246	739.9231	991.3128	1201.8194 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	588.4889	469.2476	393.5404	224.3726	93.4681	0.0000	0.0000	0.0000	0.0000	235.1260	431.2764	607.6946 (98)
Space heating												3043.2146 (98)
Space heating per m ²										(98) / (4) =		43.3259 (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													3362.6681	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	588.4889	469.2476	393.5404	224.3726	93.4681	0.0000	0.0000	0.0000	0.0000	235.1260	431.2764	607.6946	(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)	650.2640	518.5056	434.8512	247.9255	103.2797	0.0000	0.0000	0.0000	0.0000	259.8077	476.5485	671.4858	(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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993	(64)	
Efficiency of water heater (217)m	89.8063	89.7532	89.6239	89.3220	88.6602	87.3000	87.3000	87.3000	87.3000	89.3292	89.6893	89.8390	(216)	
Fuel for water heating, kWh/month	174.9576	153.5366	159.6955	141.1635	137.5589	122.1950	114.8586	129.4869	130.3466	146.4984	157.3850	169.8585	(219)	
Water heating fuel used												1737.5412	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3362.6681	(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)													37.8419	(230a)
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													112.8419	(231)
Electricity for lighting (calculated in Appendix L)													340.4401	(232)
Total delivered energy for all uses													5553.4913	(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	3362.6681	0.2160	726.3363	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1737.5412	0.2160	375.3089	(264)
Space and water heating			1101.6452	(265)
Pumps and fans	112.8419	0.5190	58.5650	(267)
Energy for lighting	340.4401	0.5190	176.6884	(268)
Total CO2, kg/year			1336.8986	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.0300	(273)

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

DER			19.0300	ZC1
Total Floor Area		TFA	70.2400	
Assumed number of occupants		N	2.2519	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6921	ZC2
CO2 emissions from cooking, equation (L16)			2.4636	ZC3
Total CO2 emissions			38.1858	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			38.1858	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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (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) = 0.1780 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4280 (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) =				0.3317 (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	0.4229	0.4146	0.4063	0.3648	0.3565	0.3151	0.3151	0.3068	0.3317	0.3565	0.3731	0.3897 (22b)
Effective ac	0.5894	0.5859	0.5825	0.5666	0.5636	0.5496	0.5496	0.5471	0.5550	0.5636	0.5696	0.5759 (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)			9.0400	1.3258	11.9848			(27)					
WT-E-01	35.5700	9.0400	26.5300	0.1800	4.7754			(29a)					
WT-I-01	27.7900	2.1200	25.6700	0.1800	4.6206			(29a)					
WT-I-11	12.7200		12.7200	0.1800	2.2896			(29a)					
Flat Roof	70.2400		70.2400	0.1300	9.1312			(30)					
Total net area of external elements Aum(A, m2)			146.3200					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	34.9216		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								12.7725 (36)					
Total fabric heat loss						(33) + (36) =	47.6941	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 32.7891	Feb 32.5960	Mar 32.4066	Apr 31.5174	May 31.3510	Jun 30.5765	Jul 30.5765	Aug 30.4331	Sep 30.8748	Oct 31.3510	Nov 31.6876	Dec 32.0395	(38)
Heat transfer coeff	80.4833	80.2901	80.1008	79.2115	79.0452	78.2707	78.2707	78.1272	78.5690	79.0452	79.3817	79.7336	(39)
Average = Sum(39)m / 12 =												79.2107	(39)
HLP	Jan 1.1458	Feb 1.1431	Mar 1.1404	Apr 1.1277	May 1.1254	Jun 1.1143	Jul 1.1143	Aug 1.1123	Sep 1.1186	Oct 1.1254	Nov 1.1302	Dec 1.1352	(40)
HLP (average)												1.1277	(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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)										Total = Sum(45)m =		1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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 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	49.1508	42.7799	45.5762	42.3764	42.0016	38.9171	40.2143	42.0016	42.3764	45.5762	45.8357	49.1508 (61)
Solar input	192.1861	167.8796	174.6678	154.9215	149.9914	132.1040	126.5657	141.0911	142.6493	162.4347	173.3958	187.6729 (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	192.1861	167.8796	174.6678	154.9215	149.9914	132.1040	126.5657	141.0911	142.6493	162.4347	173.3958	187.6729 (64)
	59.8470	52.2906	54.3170	48.0154	46.4070	40.7139	38.7654	43.4477	43.9349	50.2495	53.8727	58.3463 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	80.4394	77.8134	73.0067	66.6880	62.3750	56.5471	52.1041	58.3974	61.0206	67.5396	74.8232	78.4224	(72)
Total internal gains	357.3522	354.6239	341.4460	320.7301	299.8517	279.7288	267.0916	273.4872	284.4816	305.3978	329.2468	347.1410	(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			
East				9.0400	19.6403	0.6300	0.7000	0.7700	54.2610 (76)			
Solar gains	54.2610	106.1460	174.8073	254.9460	312.4459	319.8440	304.5045	261.5649	203.3081	125.9511	67.6571	44.6216 (83)
Total gains	411.6132	460.7699	516.2533	575.6761	612.2976	599.5728	571.5961	535.0520	487.7897	431.3490	396.9038	391.7626 (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	60.6061	60.7519	60.8955	61.5791	61.7087	62.3194	62.3194	62.4338	62.0827	61.7087	61.4471	61.1759	(86)
alpha	5.0404	5.0501	5.0597	5.1053	5.1139	5.1546	5.1546	5.1623	5.1388	5.1139	5.0965	5.0784	(87)
util living area	0.9982	0.9965	0.9907	0.9690	0.9025	0.7542	0.5841	0.6408	0.8779	0.9821	0.9965	0.9986	(88)
MIT	19.7513	19.8841	20.1294	20.4622	20.7549	20.9344	20.9858	20.9777	20.8468	20.4648	20.0501	19.7286	(89)
Th 2	19.9636	19.9658	19.9680	19.9783	19.9802	19.9891	19.9891	19.9908	19.9857	19.9802	19.9763	19.9722	(90)
util rest of house	0.9976	0.9953	0.9873	0.9567	0.8630	0.6651	0.4593	0.5153	0.8140	0.9728	0.9951	0.9982	(91)
MIT 2	18.2977	18.4931	18.8516	19.3357	19.7321	19.9437	19.9837	19.9812	19.8569	19.3471	18.7436	18.2707	(92)
Living area fraction									fLA = Living area / (4) =			0.3175	(93)
MIT	18.7592	18.9347	19.2573	19.6934	20.0568	20.2582	20.3019	20.2976	20.1712	19.7019	19.1584	18.7335	(94)
Temperature adjustment												0.0000	(95)
adjusted MIT	18.7592	18.9347	19.2573	19.6934	20.0568	20.2582	20.3019	20.2976	20.1712	19.7019	19.1584	18.7335	(96)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9966	0.9935	0.9841	0.9524	0.8665	0.6907	0.4993	0.5553	0.8276	0.9694	0.9934	0.9973	(97)
Ext temp.	410.1984	457.7796	508.0514	548.2585	530.5271	414.1329	285.3776	297.1311	403.6972	418.1472	394.2757	390.7093	(98)
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	(99)
Month fracti	1163.7217	1126.8514	1021.8667	854.9584	660.5670	442.8725	289.7496	304.5091	477.0072	719.4645	957.2128	1158.8109	(100)
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	(101)
Space heating	560.6214	449.6162	382.2786	220.8240	96.7497	0.0000	0.0000	0.0000	0.0000	224.1800	405.3147	571.4676	(102)
Space heating per m2												2911.0522	(103)
												41.4444	(104)

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													3116.7582 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	560.6214	449.6162	382.2786	220.8240	96.7497	0.0000	0.0000	0.0000	0.0000	224.1800	405.3147	571.4676	(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)	600.2370	481.3878	409.2919	236.4282	103.5864	0.0000	0.0000	0.0000	0.0000	240.0215	433.9558	611.8497	(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	192.1861	167.8796	174.6678	154.9215	149.9914	132.1040	126.5657	141.0911	142.6493	162.4347	173.3958	187.6729	(64)
Efficiency of water heater	87.5875	87.4109	86.9694	85.9431	83.9790	80.3000	80.3000	80.3000	80.3000	85.8626	87.1169	80.3000	(216)
(217)m	87.5875	87.4109	86.9694	85.9431	83.9790	80.3000	80.3000	80.3000	80.3000	85.8626	87.1169	87.6738	(217)
Fuel for water heating, kWh/month	219.4218	192.0578	200.8383	180.2606	178.6058	164.5131	157.6161	175.7050	177.6455	189.1799	199.0381	214.0581	(219)
Water heating fuel used												2248.9401	(219)
Annual totals kWh/year													
Space heating fuel - main system												3116.7582	(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)												340.4401	(232)
Total delivered energy for all uses												5781.1385	(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	3116.7582	0.2160	673.2198 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2248.9401	0.2160	485.7711 (264)
Space and water heating			1158.9908 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.4401	0.5190	176.6884 (268)
Total CO2, kg/m2/year			1374.6043 (272)
Emissions per m2 for space and water heating			16.5004 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5155 (272b)
Emissions per m2 for pumps and fans			0.5542 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5004 * 1.00) + 2.5155 + 0.5542, rounded to 2 d.p.			19.5700 (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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (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) = 0.1780 (8)
Measured/design AP50					Yes
Infiltration rate					3.1300
Number of sides sheltered					0.3345 (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) =				0.2592 (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												
	0.3305	0.3240	0.3175	0.2851	0.2786	0.2462	0.2462	0.2398	0.2592	0.2786	0.2916	0.3046 (22b)
Effective ac	0.5546	0.5525	0.5504	0.5406	0.5388	0.5303	0.5303	0.5287	0.5336	0.5388	0.5425	0.5464 (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)			9.0400	1.2357	11.1711		(27)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Flat Roof	70.2400		70.2400	0.1500	10.5360		(30)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.0101		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Floor 1			70.2400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9770 (36)
Total fabric heat loss						(33) + (36) =	53.9871 (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	30.8531	30.7351	30.6195	30.0764	29.9747	29.5017	29.5017	29.4141	29.6839	29.9747	30.1803	30.3952 (38)
Heat transfer coeff	84.8402	84.7222	84.6066	84.0634	83.9618	83.4888	83.4888	83.4012	83.6710	83.9618	84.1674	84.3823 (39)
Average = Sum(39)m / 12 =												84.0630 (39)
HLP	1.2079	1.2062	1.2045	1.1968	1.1954	1.1886	1.1886	1.1874	1.1912	1.1954	1.1983	1.2013 (40)
HLP (average)												1.1968 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (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)
	30.3950	26.5837	27.4320	23.9159	22.9478	19.8022	18.3497	21.0565	21.3080	24.8324	27.1065	29.4359 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	40.8535	39.5590	36.8709	33.2165	30.8439	27.5031	24.6635	28.3018	29.5945	33.3769	37.6480	39.5644	(72)
Total internal gains	314.7663	313.3696	302.3102	284.2586	265.3205	247.6848	236.6511	240.3915	250.0554	268.2351	289.0716	305.2830	(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
East				9.0400	19.6403	0.4500	0.0000			0.7700			61.5204 (76)
Solar gains	61.5204	120.3469	198.1942	289.0544	354.2471	362.6349	345.2432	296.5588	230.5081	142.8017	76.7087	50.5914	(83)
Total gains	376.2866	433.7165	500.5044	573.3130	619.5676	610.3197	581.8943	536.9504	480.5635	411.0368	365.7802	355.8744	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	57.4937	57.5738	57.6525	58.0250	58.0952	58.4244	58.4244	58.4857	58.2971	58.0952	57.9533	57.8057		
alpha	4.8329	4.8383	4.8435	4.8683	4.8730	4.8950	4.8950	4.8990	4.8865	4.8730	4.8636	4.8537		
util living area	0.9988	0.9973	0.9923	0.9723	0.9100	0.7709	0.6051	0.6689	0.8964	0.9864	0.9976	0.9991	(86)	
MIT	19.6226	19.7672	20.0333	20.3905	20.7122	20.9152	20.9797	20.9675	20.8055	20.3797	19.9330	19.5931	(87)	
Th 2	19.9137	19.9151	19.9164	19.9226	19.9237	19.9291	19.9291	19.9301	19.9270	19.9237	19.9214	19.9189	(88)	
util rest of house	0.9984	0.9964	0.9893	0.9608	0.8714	0.6792	0.4709	0.5349	0.8361	0.9790	0.9966	0.9988	(89)	
MIT 2	18.6581	18.8033	19.0691	19.4244	19.7240	19.8888	19.9239	19.9205	19.8132	19.4192	18.9742	18.6327	(90)	
Living area fraction									fLA = Living area / (4) =			0.3175	(91)	
MIT	18.9643	19.1093	19.3752	19.7311	20.0377	20.2147	20.2591	20.2529	20.1282	19.7241	19.2786	18.9376	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.9643	19.1093	19.3752	19.7311	20.0377	20.2147	20.2591	20.2529	20.1282	19.7241	19.2786	18.9376	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9978	0.9954	0.9874	0.9583	0.8761	0.7060	0.5141	0.5780	0.8496	0.9771	0.9957	0.9984	(94)
Useful gains	375.4746	431.7248	494.1807	549.3933	542.8324	430.8908	299.1580	310.3770	408.2657	401.6262	364.2098	355.2886	(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	1244.1218	1203.8470	1089.3299	910.5015	700.0497	468.7607	305.4925	321.3391	504.3896	766.0790	1025.0419	1243.5937	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	646.2735	518.8661	442.7910	259.9979	116.9697	0.0000	0.0000	0.0000	0.0000	271.1529	475.7991	660.8990	(98)
Space heating												3392.7492	(98)
Space heating per m2										(98) / (4) =		48.3022	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	784.7945	617.8169	633.8489	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8371	0.9048	0.8749	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	656.9429	559.0192	554.5324	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	797.7512	762.8934	711.9518	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	101.3820	151.6823	117.1200	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												370.1844	(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	25.3455	37.9206	29.2800	0.0000	0.0000	0.0000 (107)
Space cooling											92.5461 (107)
Space cooling per m2											1.3176 (108)
Energy for space heating											48.3022 (99)
Energy for space cooling											1.3176 (108)
Total											49.6198 (109)
Dwelling Fabric Energy Efficiency (DFEE)											49.6 (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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (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) = 0.1780 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4280 (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) =				0.3317 (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	0.4229	0.4146	0.4063	0.3648	0.3565	0.3151	0.3151	0.3068	0.3317	0.3565	0.3731	0.3897 (22b)
	0.5894	0.5859	0.5825	0.5666	0.5636	0.5496	0.5496	0.5471	0.5550	0.5636	0.5696	0.5759 (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)			9.0400	1.3258	11.9848			(27)					
WT-E-01	35.5700	9.0400	26.5300	0.1800	4.7754			(29a)					
WT-I-01	27.7900	2.1200	25.6700	0.1800	4.6206			(29a)					
WT-I-11	12.7200		12.7200	0.1800	2.2896			(29a)					
Flat Roof	70.2400		70.2400	0.1300	9.1312			(30)					
Total net area of external elements Aum(A, m2)			146.3200					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	34.9216		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								12.7725 (36)					
Total fabric heat loss						(33) + (36) =	47.6941	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 32.7891	Feb 32.5960	Mar 32.4066	Apr 31.5174	May 31.3510	Jun 30.5765	Jul 30.5765	Aug 30.4331	Sep 30.8748	Oct 31.3510	Nov 31.6876	Dec 32.0395	(38)
Heat transfer coeff	80.4833	80.2901	80.1008	79.2115	79.0452	78.2707	78.2707	78.1272	78.5690	79.0452	79.3817	79.7336	(39)
Average = Sum(39)m / 12 =												79.2107	(39)
HLP	Jan 1.1458	Feb 1.1431	Mar 1.1404	Apr 1.1277	May 1.1254	Jun 1.1143	Jul 1.1143	Aug 1.1123	Sep 1.1186	Oct 1.1254	Nov 1.1302	Dec 1.1352	(40)
HLP (average)												1.1277	(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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)										Total = Sum(45)m =		1379.6031 (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)
	30.3950	26.5837	27.4320	23.9159	22.9478	19.8022	18.3497	21.0565	21.3080	24.8324	27.1065	29.4359 (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	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	112.5969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2771	17.1218	13.9244	10.5416	7.8800	6.6526	7.1884	9.3438	12.5412	15.9239	18.5855	19.8129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8566	199.9097	194.7359	183.7214	169.8176	156.7500	148.0201	145.9669	151.1408	162.1552	176.0590	189.1266	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	34.2597	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	40.8535	39.5590	36.8709	33.2165	30.8439	27.5031	24.6635	28.3018	29.5945	33.3769	37.6480	39.5644	(72)
Total internal gains	314.7663	313.3696	302.3102	284.2586	265.3205	247.6848	236.6511	240.3915	250.0554	268.2351	289.0716	305.2830	(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	
-----					-----	-----		-----	-----	-----		-----	
East					9.0400	19.6403		0.6300	0.7000	0.7700		54.2610 (76)	
-----					-----	-----		-----	-----	-----		-----	
Solar gains	54.2610	106.1460	174.8073	254.9460	312.4459	319.8440	304.5045	261.5649	203.3081	125.9511	67.6571	44.6216 (83)	
Total gains	369.0272	419.5155	477.1175	539.2046	577.7665	567.5288	541.1556	501.9564	453.3636	394.1862	356.7286	349.9046 (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	60.6061	60.7519	60.8955	61.5791	61.7087	62.3194	62.3194	62.4338	62.0827	61.7087	61.4471	61.1759	
alpha	5.0404	5.0501	5.0597	5.1053	5.1139	5.1546	5.1546	5.1623	5.1388	5.1139	5.0965	5.0784	
util living area	0.9989	0.9977	0.9934	0.9761	0.9190	0.7811	0.6124	0.6744	0.9020	0.9877	0.9979	0.9992	(86)
MIT	19.6948	19.8298	20.0792	20.4198	20.7258	20.9225	20.9825	20.9719	20.8209	20.4188	19.9970	19.6728	(87)
Th 2	19.9636	19.9658	19.9680	19.9783	19.9802	19.9891	19.9891	19.9908	19.9857	19.9802	19.9763	19.9722	(88)
util rest of house	0.9986	0.9969	0.9909	0.9662	0.8839	0.6940	0.4838	0.5463	0.8453	0.9811	0.9969	0.9989	(89)
MIT 2	18.7698	18.9063	19.1563	19.4996	19.7870	19.9515	19.9845	19.9823	19.8792	19.5037	19.0819	18.7548	(90)
Living area fraction									fLA = Living area / (4) =				
MIT	19.0635	19.1995	19.4493	19.7917	20.0850	20.2598	20.3013	20.2965	20.1781	19.7943	19.3724	19.0463	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0635	19.1995	19.4493	19.7917	20.0850	20.2598	20.3013	20.2965	20.1781	19.7943	19.3724	19.0463	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9981	0.9961	0.9893	0.9639	0.8881	0.7195	0.5252	0.5875	0.8581	0.9795	0.9962	0.9986	(94)
Ext temp.	368.3254	417.8630	472.0059	519.7504	513.1070	408.3418	284.2144	294.9236	389.0115	386.0968	355.3747	349.3988	(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	1188.2110	1148.1058	1037.2492	862.7515	662.7959	442.9940	289.7059	304.4223	477.5532	726.7621	974.2060	1183.7461	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	609.9948	490.7232	420.5410	246.9608	111.3686	0.0000	0.0000	0.0000	0.0000	253.4550	445.5585	620.7544	(98)
												3199.3562	(98)
												45.5489	(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	735.7441	579.2028	593.7669	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8442	0.9118	0.8844	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	621.1257	528.1362	525.0995	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	747.7359	715.2767	671.0498	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	91.1593	139.2325	108.5870	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												338.9788	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													
													fC = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	22.7898	34.8081	27.1467	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												84.7447 (107)
Energy for space heating												1.2065 (108)
Energy for space cooling												45.5489 (99)
Total												1.2065 (108)
Target Fabric Energy Efficiency (TFEE)												46.7554 (109)
												53.8 (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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (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					3.1300
Infiltration rate					0.1565 (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) =				0.1213 (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	0.1274	0.1213	0.1213	0.1122	0.1122	0.1001	0.1031	0.0970	0.1001	0.1061	0.1061	0.1152 (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)			9.0400	1.2357	11.1711		(27)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Flat Roof	70.2400		70.2400	0.1500	10.5360		(30)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.0101		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Floor 1			70.2400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9770 (36)
Total fabric heat loss							(33) + (36) = 53.9871 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021 (39)
Average = Sum(39)m / 12 =												81.8021 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646 (40)
HLP (average)												1.1646 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
RHI water heating demand	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (65)
Heat gains from water heating, kWh/month												1545 (64)
												1545 (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	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.1928	42.8044	34.8109	26.3541	19.7000	16.6316	17.9710	23.3594	31.3529	39.8097	46.4638	49.5323 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3083	298.3727	290.6505	274.2110	253.4591	233.9553	220.9255	217.8611	225.5832	242.0227	262.7746	282.2785 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636 (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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775 (71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370 (72)
Total internal gains	510.9609	506.6040	486.6715	456.0445	424.9173	397.1072	380.9674	388.9951	406.7394	437.5666	471.6701	497.2500 (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	
East				9.0400	22.3313	0.4500	0.0000		0.7700		69.9497 (76)	
Solar gains	69.9497	123.0867	199.8710	299.5493	356.9257	390.7204	368.0744	323.8182	251.6920	155.8605	89.3522	56.9651 (83)
Total gains	580.9106	629.6906	686.5425	755.5939	781.8430	787.8276	749.0419	712.8133	658.4313	593.4271	561.0223	554.2151 (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	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	
alpha	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	
util living area	0.9899	0.9839	0.9633	0.8990	0.7510	0.5094	0.3375	0.3656	0.6747	0.9201	0.9799	0.9917 (86)	
MIT	20.0324	20.1462	20.3983	20.6950	20.9103	20.9897	20.9990	20.9985	20.9597	20.7027	20.3150	19.9985 (87)	
Th 2	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484 (88)	
util rest of house	0.9865	0.9786	0.9508	0.8657	0.6793	0.4071	0.2236	0.2464	0.5716	0.8853	0.9721	0.9889 (89)	
MIT 2	19.0929	19.2049	19.4500	19.7245	19.8987	19.9454	19.9483	19.9483	19.9324	19.7383	19.3723	19.0596 (90)	
Living area fraction									fLA = Living area / (4) =				0.3175 (91)
MIT	19.3912	19.5038	19.7511	20.0326	20.2198	20.2770	20.2819	20.2817	20.2585	20.0445	19.6716	19.3576 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.2412	19.3538	19.6011	19.8826	20.0698	20.1270	20.1319	20.1317	20.1085	19.8945	19.5216	19.2076 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9836	0.9747	0.9457	0.8632	0.6883	0.4249	0.2436	0.2673	0.5884	0.8831	0.9679	0.9863 (94)
Useful gains	571.3602	613.7469	649.2472	652.2547	538.1038	334.7292	182.4498	190.5385	387.4169	524.0766	543.0222	546.6274 (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	1156.7780	1125.0885	998.0763	816.6015	578.3288	337.5939	182.5728	190.7366	401.5270	678.5077	942.4898	1154.0359 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	435.5508	343.6215	259.5289	118.3296	29.9274	0.0000	0.0000	0.0000	0.0000	114.8968	287.6167	451.9119 (98)
Space heating												2041.3836 (98)
RHI space heating demand												2041 (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	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (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							3.1300					
Infiltration rate							0.1565	(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) =	0.1213	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
Mechanical extract ventilation - decentralised	0.1546	0.1516	0.1486	0.1334	0.1304	0.1152	0.1152	0.1122	0.1213	0.1304	0.1364	0.1425
If mechanical ventilation:												0.5000
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

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)			9.0400	1.2357	11.1711		(27)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Flat Roof	70.2400		70.2400	0.1500	10.5360		(30)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.0101		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Floor 1			70.2400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9770 (36)
Total fabric heat loss						(33) + (36) =	53.9871 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021 (39)
Average = Sum(39)m / 12 =												81.8021 (39)
HLP	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646 (40)
HLP (average)												1.1646 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)
Daily hot water use	Jan 96.4519	Feb 92.9445	Mar 89.4372	Apr 85.9298	May 82.4225	Jun 78.9152	Jul 78.9152	Aug 82.4225	Sep 85.9298	Oct 89.4372	Nov 92.9445	Dec 96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
Heat gains from water heating, kWh/month	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (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	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.1928	42.8044	34.8109	26.3541	19.7000	16.6316	17.9710	23.3594	31.3529	39.8097	46.4638	49.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3083	298.3727	290.6505	274.2110	253.4591	233.9553	220.9255	217.8611	225.5832	242.0227	262.7746	282.2785	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370	(72)
Total internal gains	510.9609	506.6040	486.6715	456.0445	424.9173	397.1072	380.9674	388.9951	406.7394	437.5666	471.6701	497.2500	(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
-----					-----	-----	-----	-----	-----					-----
East					9.0400	19.6403	0.4500	0.0000	0.7700					61.5204 (76)
-----					-----	-----	-----	-----	-----					-----
Solar gains	61.5204	120.3469	198.1942	289.0544	354.2471	362.6349	345.2432	296.5588	230.5081	142.8017	76.7087	50.5914	(83)	
Total gains	572.4813	626.9509	684.8657	745.0990	779.1644	759.7421	726.2107	685.5539	637.2474	580.3684	548.3787	547.8414	(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	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	
alpha	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	
util living area	0.9923	0.9868	0.9714	0.9263	0.8225	0.6514	0.4879	0.5360	0.7784	0.9472	0.9861	0.9938	(86)
MIT	19.9358	20.0687	20.3055	20.6005	20.8402	20.9618	20.9925	20.9882	20.9088	20.5986	20.2048	19.8934	(87)
Th 2	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	(88)
util rest of house	0.9898	0.9826	0.9621	0.9018	0.7676	0.5596	0.3753	0.4200	0.6959	0.9243	0.9808	0.9918	(89)
MIT 2	18.9971	19.1284	19.3600	19.6393	19.8462	19.9319	19.9466	19.9453	19.9018	19.6440	19.2641	18.9551	(90)
Living area fraction	19.2951	19.4269	19.6602	19.9444	20.1618	20.2589	20.2787	20.2764	20.2215	19.9471	19.5628	19.2530	(91)
MIT	19.1451	19.2769	19.5102	19.7944	20.0118	20.1089	20.1287	20.1264	20.0715	19.7971	19.4128	19.1030	(92)
Temperature adjustment												-0.1500	
adjusted MIT													(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9873	0.9791	0.9572	0.8976	0.7713	0.5744	0.3950	0.4402	0.7066	0.9202	0.9773	0.9896	(94)
Ext temp.	565.2219	613.8446	655.5213	668.8045	600.9781	436.3744	286.8814	301.8024	450.3053	534.0765	535.9168	542.1549	(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	1214.3606	1176.0624	1064.2609	891.1885	679.9217	450.6399	288.6539	304.8282	488.4832	752.3411	1007.2095	1219.0941	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(98)
Space heating per m ²	482.9591	377.8104	304.1023	160.1165	58.7340	0.0000	0.0000	0.0000	0.0000	162.3889	339.3307	503.6428	(99)
												2389.0847	(98)
												34.0132	(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	2639.8726 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	482.9591	377.8104	304.1023	160.1165	58.7340	0.0000	0.0000	0.0000	0.0000	162.3889	339.3307	503.6428 (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)	533.6565	417.4701	336.0246	176.9243	64.8994	0.0000	0.0000	0.0000	0.0000	179.4352	374.9511	556.5113 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
Efficiency of water heater (217)m	89.6930	89.6220	89.4507	89.0618	88.3150	87.3000	87.3000	87.3000	87.3000	89.0435	89.5358	87.3000 (216)
Fuel for water heating, kWh/month	175.1787	153.7613	160.0046	141.5760	138.0965	122.1950	114.8586	129.4869	130.3466	146.9685	157.6548	170.0552 (219)
Water heating fuel used	1740.1828 (219)											
Annual totals kWh/year												
Space heating fuel - main system	2639.8726 (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)												37.8419 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												112.8419 (231)
Electricity for lighting (calculated in Appendix L)												340.4401 (232)
Total delivered energy for all uses												4833.3374 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2639.8726	3.4800	91.8676 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1740.1828	3.4800	60.5584 (247)
Mechanical ventilation fans	37.8419	13.1900	4.9914 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	340.4401	13.1900	44.9041 (250)
Additional standing charges			120.0000 (251)
Total energy cost			332.2138 (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] =		1.2108 (257)
SAP value			83.1097
SAP rating (Section 12)			83 (258)
SAP band			B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2639.8726	0.2160	570.2125 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1740.1828	0.2160	375.8795 (264)
Space and water heating			946.0920 (265)
Pumps and fans	112.8419	0.5190	58.5650 (267)
Energy for lighting	340.4401	0.5190	176.6884 (268)
Total kg/year			1181.3454 (272)
CO2 emissions per m2			16.8200 (273)
EI value			86.2634
EI rating			86 (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	$3.48 / 0.8864 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8864 = 0.2437$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.2400 (1b)	x 2.4000 (2b)	= 168.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.5760 (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					3.1300
Infiltration rate					0.1565 (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) =				0.1213 (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	0.1274	0.1213	0.1213	0.1122	0.1122	0.1001	0.1031	0.0970	0.1001	0.1061	0.1061	0.1152 (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)			9.0400	1.2357	11.1711		(27)
WT-E-01	35.5700	9.0400	26.5300	0.2000	5.3060		(29a)
WT-I-01	27.7900	2.1200	25.6700	0.2890	7.4184		(29a)
WT-I-11	12.7200		12.7200	0.2719	3.4586		(29a)
Flat Roof	70.2400		70.2400	0.1500	10.5360		(30)
Total net area of external elements Aum(A, m ²)			146.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.0101		(33)
Party Wall 1			11.5200	0.0000	0.0000		(32)
Party Floor 1			70.2400				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9770 (36)
Total fabric heat loss							(33) + (36) = 53.9871 (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	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150	27.8150 (38)
Heat transfer coeff	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021	81.8021 (39)
Average = Sum(39)m / 12 =												81.8021 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646	1.1646 (40)
HLP (average)												1.1646 (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												2.2519 (42)
Average daily hot water use (litres/day)												87.6835 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4519	92.9445	89.4372	85.9298	82.4225	78.9152	78.9152	82.4225	85.9298	89.4372	92.9445	96.4519 (44)
Energy conte	143.0353	125.0996	129.0916	112.5452	107.9898	93.1870	86.3514	99.0895	100.2730	116.8585	127.5602	138.5221 (45)
Energy content (annual)												Total = Sum(45)m = 1379.6031 (45)
Distribution loss (46)m = 0.15 x (45)m												

Regs Region: England

Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	21.4553	18.7649	19.3637	16.8818	16.1985	13.9780	12.9527	14.8634	15.0409	17.5288	19.1340	20.7783 (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	14.0877	12.7043	14.0337	13.5449	13.9702	13.4893	13.9201	13.9526	13.5196	14.0074	13.5973	14.0772 (61)
Total heat required for water heating calculated for each month	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993 (64)
Heat gains from water heating, kWh/month	51.0812	44.7717	46.4314	40.8075	39.3991	34.3570	32.1919	36.4354	36.7207	42.3573	45.8131	49.5779 (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	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	135.1162	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.1928	42.8044	34.8109	26.3541	19.7000	16.6316	17.9710	23.3594	31.3529	39.8097	46.4638	49.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.3083	298.3727	290.6505	274.2110	253.4591	233.9553	220.9255	217.8611	225.5832	242.0227	262.7746	282.2785	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	50.7636	(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)	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	-90.0775	(71)
Water heating gains (Table 5)	68.6575	66.6246	62.4078	56.6771	52.9558	47.7180	43.2687	48.9723	51.0009	56.9318	63.6293	66.6370	(72)
Total internal gains	510.9609	506.6040	486.6715	456.0445	424.9173	397.1072	380.9674	388.9951	406.7394	437.5666	471.6701	497.2500	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
East				9.0400	22.3313		0.4500		0.0000	0.7700	69.9497 (76)	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Solar gains	69.9497	123.0867	199.8710	299.5493	356.9257	390.7204	368.0744	323.8182	251.6920	155.8605	89.3522	56.9651 (83)
Total gains	580.9106	629.6906	686.5425	755.5939	781.8430	787.8276	749.0419	712.8133	658.4313	593.4271	561.0223	554.2151 (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	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	59.6290	
alpha	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	4.9753	
util living area	0.9899	0.9839	0.9633	0.8990	0.7510	0.5094	0.3375	0.3656	0.6747	0.9201	0.9799	0.9917	(86)
MIT	20.0324	20.1462	20.3983	20.6950	20.9103	20.9897	20.9990	20.9985	20.9597	20.7027	20.3150	19.9985	(87)
Th 2	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	19.9484	(88)
util rest of house	0.9865	0.9786	0.9508	0.8657	0.6793	0.4071	0.2236	0.2464	0.5716	0.8853	0.9721	0.9889	(89)
MIT 2	19.0929	19.2049	19.4500	19.7245	19.8987	19.9454	19.9483	19.9483	19.9324	19.7383	19.3723	19.0596	(90)
Living area fraction	19.3912	19.5038	19.7511	20.0326	20.2198	20.2770	20.2819	20.2817	20.2585	20.0445	19.6716	19.3576	(91)
MIT	19.3912	19.5038	19.7511	20.0326	20.2198	20.2770	20.2819	20.2817	20.2585	20.0445	19.6716	19.3576	(92)
Temperature adjustment	19.2412	19.3538	19.6011	19.8826	20.0698	20.1270	20.1319	20.1317	20.1085	19.8945	19.5216	19.2076	(93)
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9836	0.9747	0.9457	0.8632	0.6883	0.4249	0.2436	0.2673	0.5884	0.8831	0.9679	0.9863	(94)
Ext temp.	571.3602	613.7469	649.2472	652.2547	538.1038	334.7292	182.4498	190.5385	387.4169	524.0766	543.0222	546.6274	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Month fracti	1156.7780	1125.0885	998.0763	816.6015	578.3288	337.5939	182.5728	190.7366	401.5270	678.5077	942.4898	1154.0359	(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	435.5508	343.6215	259.5289	118.3296	29.9274	0.0000	0.0000	0.0000	0.0000	114.8968	287.6167	451.9119	(98)
Space heating per m2												2041.3836	(98)
												29.0630	(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												2255.6725	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	435.5508	343.6215	259.5289	118.3296	29.9274	0.0000	0.0000	0.0000	0.0000	114.8968	287.6167	451.9119	(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)	481.2716	379.6923	286.7722	130.7510	33.0689	0.0000	0.0000	0.0000	0.0000	126.9578	317.8085	499.3502	(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	157.1230	137.8039	143.1252	126.0901	121.9600	106.6763	100.2715	113.0421	113.7926	130.8659	141.1575	152.5993	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.6290	89.5603	89.3360	88.8204	87.9125	87.3000	87.3000	87.3000	87.3000	88.7674	89.4209	89.6703	(217)
Fuel for water heating, kWh/month	175.3037	153.8672	160.2100	141.9606	138.7288	122.1950	114.8586	129.4869	130.3466	147.4256	157.8574	170.1782	(219)
Water heating fuel used												1742.4187	(219)
Annual totals kWh/year													
Space heating fuel - main system												2255.6725	(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)												37.8419	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												112.8419	(231)
Electricity for lighting (calculated in Appendix L)												340.4401	(232)
Total delivered energy for all uses												4451.3733	(238)

10a. Fuel costs - using BEDF prices (485)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2255.6725	3.7400	84.3622 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1742.4187	3.7400	65.1665 (247)
Mechanical ventilation fans	37.8419	19.1200	7.2354 (249)
Pumps and fans for heating	75.0000	19.1200	14.3400 (249)
Energy for lighting	340.4401	19.1200	65.0922 (250)
Additional standing charges			94.0000 (251)
Total energy cost			330.1961 (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	2255.6725	0.2160	487.2253 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1742.4187	0.2160	376.3624 (264)
Space and water heating			863.5877 (265)
Pumps and fans	112.8419	0.5190	58.5650 (267)
Energy for lighting	340.4401	0.5190	176.6884 (268)
Total kg/year			1098.8411 (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	2255.6725	1.2200	2751.9205 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1742.4187	1.2200	2125.7508 (264)
Space and water heating			4877.6713 (265)
Pumps and fans	112.8419	3.0700	346.4248 (267)
Energy for lighting	340.4401	3.0700	1045.1512 (268)
Primary energy kWh/year			6269.2473 (272)
Primary energy kWh/m2/year			89.2547 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 86

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²
Potential energy efficiency rating:		B 83	
Potential environmental impact rating:			B 86

Fuel prices for cost data on this page from database revision number 485 TEST (29 Oct 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	£244	£244	£0
Space heating	£200	£200	£0
Water heating	£65	£65	£0
Lighting	£65	£65	£0
Total cost of fuels	£331	£331	£0
Total cost of uses	£330	£330	£0
Delivered energy	63 kWh/m²	63 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	16 kg/m²	16 kg/m²	0 kg/m²
Primary energy	89 kWh/m²	89 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 250.0
 Night ventilation Yes
 Ventilation rate during hot weather (ach) 3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient 166.89 (P1)
 Transmission heat loss coefficient 53.99 (P7)
 Summer heat loss coefficient 220.88 (P2)

Overhangs		Ratio		Z_overhangs	Overhang type	
Orientation						
East		0.000		1.000	None	
Solar shading						
Orientation		Z blinds		Solar access	Z overhangs	Z summer
East		1.000		0.90	1.000	0.900 (P8)
[Jul]	Area	Solar flux	g	FF	Shading	Gains
	m2	Table 6a	Specific data	Specific data		W
		W/m2	or Table 6b	or Table 6c		
East	9.0400	117.5071	0.4500	0.0000	0.9000	430.2169
total:						430.2169

	Jun	Jul	Aug	
Solar gains	457	430	378	(P4)
Internal gains	394	378	386	
Total summer gains	851	808	764	(P5)
Summer gain/loss ratio	3.85	3.66	3.46	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.10	21.81	21.51	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			