

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	4907-T511-3796-216			Issued on Date	08/09/2023
Assessment Reference	As Built	Prop Type Ref	2F Flat Semi		
Property	52, Pembers Farm Avenue, Fair Oak, EASTLEIGH, SO50 7QL				
SAP Rating	81 B	DER	18.61	TER	25.35
Environmental	88 B	% DER<TER	26.60		
CO ₂ Emissions (t/year)	0.74	DFEE	65.89	TFEE	75.38
General Requirements Compliance	Pass	% DFEE<TFEE	12.60		
Assessor Details	Miss Lindsey Dean, Lindsey Dean, Tel: 01884 242050, Lindsey.dean@aessc.co.uk			Assessor ID	T510-0001
Client	Drew Smith				

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

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DWELLING AS BUILT

Top-floor flat, total floor area 47 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) 25.35 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.61 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)75.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)65.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.33 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.30 (max. 0.35)	OK
Openings	1.34 (max. 2.00)	1.80 (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: 4.43 (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 30
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: Time and temperature zone control 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: 0.1700 0.1800
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Southern England): Medium OK
Based on:
Overshading: Average
Windows facing North: 1.63 m², No overhang
Windows facing West: 4.85 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Exposed floor U-value 0.11 W/m²K
Door U-value 0.63 W/m²K
Photovoltaic array 397.21 kWh/Year

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.5900 (1b)	x 2.3400 (2b)	= 109.0206 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.0206 (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)			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							4.4300					
Infiltration rate							0.2215	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1883	(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 (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												
	0.2401	0.2353	0.2306	0.2071	0.2024	0.1789	0.1789	0.1742	0.1883	0.2024	0.2118	0.2212 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (Uw = 1.40)			4.3600	1.3258	5.7803		(27)					
French Door (Uw = 1.40)			2.1200	1.3258	2.8106		(27)					
DTC			2.1200	0.6300	1.3356		(26)					
Roof Window (Uw = 1.80)			2.3600	1.6791	3.9627		(27a)					
Exposed Floor to Stairwell			8.2100	0.1100	0.9031	20.0000	164.2000 (28b)					
140mm Timber Frame	14.0700	1.6300	12.4400	0.1900	2.3636	9.0000	111.9600 (29a)					
WTS	12.9200	2.1200	10.8000	0.1500	1.6200	18.0000	194.4000 (29a)					
WTV	17.2300		17.2300	0.2200	3.7906	9.0000	155.0700 (29a)					
Dormer Cheek	3.1000	1.2600	1.8400	0.3300	0.6072	9.0000	16.5600 (29a)					
Timber Stud Wall	8.9000	3.5900	5.3100	0.2800	1.4868	9.0000	47.7900 (29a)					
Rooflight Stud Wall	14.2200		14.2200	0.3000	4.2660	9.0000	127.9800 (29a)					
400mm Mineral Wool	37.2100		37.2100	0.1100	4.0931	9.0000	334.8900 (30)					
Sloping	7.1300		7.1300	0.2000	1.4260	9.0000	64.1700 (30)					
Dormer Roof	1.5100		1.5100	0.2800	0.4228	9.0000	13.5900 (30)					
Rooflight Sloping	2.5100	2.3600	0.1500	0.3000	0.0450	9.0000	1.3500 (30)					
Total net area of external elements Aum(A, m2)			127.0100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9134		(33)					
Timebr Frame				11.1400	0.0000	0.0000	(32)					
Party Floor				38.3800		20.0000	222.8000 (32)					
Timber				73.1400		30.0000	1151.4000 (32d)					
						9.0000	658.2600 (32c)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			3264.4200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							70.0670 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.0402 (36)					
Total fabric heat loss				(33) + (36) =			57.9536 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.9884	Feb 17.9884	Mar 17.9884	Apr 17.9884	May 17.9884	Jun 17.9884	Jul 17.9884	Aug 17.9884	Sep 17.9884	Oct 17.9884	Nov 17.9884	Dec 17.9884 (38)
Heat transfer coeff	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420 (39)
Average = Sum(39)m / 12 =	75.9420 (39)											
HLP	Jan 1.6300	Feb 1.6300	Mar 1.6300	Apr 1.6300	May 1.6300	Jun 1.6300	Jul 1.6300	Aug 1.6300	Sep 1.6300	Oct 1.6300	Nov 1.6300	Dec 1.6300 (40)
HLP (average)	1.6300 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5904 (42)
Average daily hot water use (litres/day)												71.9718 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	79.1690	76.2901	73.4112	70.5323	67.6535	64.7746	64.7746	67.6535	70.5323	73.4112	76.2901	79.1690 (44)
Energy content	117.4053	102.6834	105.9601	92.3786	88.6394	76.4891	70.8784	81.3340	82.3054	95.9190	104.7030	113.7007 (45)
Energy content (annual)	Total = Sum (45)m =											1132.3962 (45)
Distribution loss (46)m = 0.15 x (45)m	17.6108	15.4025	15.8940	13.8568	13.2959	11.4734	10.6318	12.2001	12.3458	14.3878	15.7055	17.0551 (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	14.4958	13.0761	14.4503	13.9538	14.3968	13.9069	14.3546	14.3820	13.9325	14.4282	13.9979	14.4870 (61)
Total heat required for water heating calculated for each month	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877 (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	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877 (64)
Heat gains from water heating, kWh/month	42.6612	37.4113	38.8443	34.2043	33.0718	28.9094	27.1557	30.6390	30.8496	35.5001	38.3132	41.4272 (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	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.4235	11.0345	8.9738	6.7938	5.0784	4.2874	4.6327	6.0218	8.0824	10.2625	11.9778	12.7688 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.3877	139.8237	136.2050	128.5011	118.7763	109.6364	103.5303	102.0943	105.7131	113.4170	123.1418	132.2817 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520 (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)	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156 (71)
Water heating gains (Table 5)	57.3403	55.6715	52.2101	47.5060	44.4514	40.1519	36.4996	41.1815	42.8467	47.7152	53.2128	55.6818 (72)
Total internal gains	258.0074	256.3856	247.2447	232.6567	218.1619	203.9315	194.5185	199.1534	206.4981	221.2505	238.1883	250.5881 (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			1.6300		10.6334		0.7200		0.7000		0.7700		6.0537 (74)
West			2.7300		19.6403		0.7200		0.7000		0.7700		18.7272 (80)
West			2.1200		19.6403		0.7200		0.7000		0.7700		14.5428 (80)
East			1.5700		25.9287		0.6300		0.7000		1.0000		16.1570 (82)
West			0.7900		25.9287		0.6300		0.7000		1.0000		8.1300 (82)
Solar gains	63.6108	125.2439	209.6270	313.0854	391.5671	404.6347	383.6482	324.0457	246.0149	149.3757	79.4271	52.2569	(83)
Total gains	321.6182	381.6294	456.8717	545.7421	609.7290	608.5662	578.1667	523.1991	452.5130	370.6261	317.6154	302.8450	(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	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405
alpha	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960
util living area	0.9351	0.9116	0.8682	0.7923	0.6885	0.5685	0.4617	0.5090	0.6884	0.8449	0.9162	0.9413 (86)
MIT	17.2774	17.6342	18.2894	19.1281	19.8978	20.4612	20.7415	20.6805	20.1824	19.1660	18.0581	17.1879 (87)
Th 2	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914 (88)
util rest of house	0.9259	0.8992	0.8491	0.7605	0.6368	0.4861	0.3448	0.3926	0.6159	0.8137	0.9022	0.9330 (89)
MIT 2	14.8468	15.3464	16.2601	17.4106	18.4319	19.1340	19.4386	19.3883	18.8312	17.4965	15.9535	14.7213 (90)
Living area fraction	fLA = Living area / (4) =											0.4602 (91)
MIT	15.9653	16.3992	17.1939	18.2010	19.1065	19.7448	20.0382	19.9830	19.4530	18.2648	16.9220	15.8564 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.8153	16.2492	17.0439	18.0510	18.9565	19.5948	19.8882	19.8330	19.3030	18.1148	16.7720	15.7064 (93)

8. Space heating requirement

Utilisation	0.8883	0.8563	0.8020	0.7168	0.6095	0.4863	0.3718	0.4148	0.5981	0.7696	0.8607	0.8973 (94)
Useful gains	285.6995	326.7784	366.4163	391.2125	371.6160	295.9543	214.9865	217.0450	270.6643	285.2431	273.3768	271.7335 (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)

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Heat loss rate W	874.4969	861.8821	800.7276	694.9442	551.0702	379.3135	249.7123	260.7064	395.1283	570.6867	734.5106	873.8190 (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	438.0653	359.5897	323.1276	218.6869	133.5139	0.0000	0.0000	0.0000	0.0000	212.3700	332.0163	447.9516 (98)
Space heating												2465.3213 (98)
Space heating per m2											(98) / (4) =	52.9152 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
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												2724.1120 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	438.0653	359.5897	323.1276	218.6869	133.5139	0.0000	0.0000	0.0000	0.0000	212.3700	332.0163	447.9516 (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)	484.0500	397.3367	357.0471	241.6429	147.5292	0.0000	0.0000	0.0000	0.0000	234.6630	366.8689	494.9741 (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	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877 (64)
Efficiency of water heater	89.7388	89.6993	89.6083	89.4276	89.0778	87.3000	87.3000	87.3000	87.3000	89.3798	89.6347	87.3000 (216)
Fuel for water heating, kWh/month	146.9833	129.0528	134.3741	118.9033	115.6700	103.5464	97.6323	109.6403	110.2380	123.4587	132.4275	89.7679 (217)
Water heating fuel used												142.7990 (219)
Annual totals kWh/year												1464.7258 (219)
Space heating fuel - main system												2724.1120 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.7450, total flow = 21.0000, SFP = 0.2260)												
mechanical ventilation fans (SFP = 0.2260)												30.0528 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												105.0528 (231)
Electricity for lighting (calculated in Appendix L)												219.4033 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												4513.2939 (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	2724.1120	0.2160	588.4082 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1464.7258	0.2160	316.3808 (264)
Space and water heating			904.7890 (265)
Pumps and fans	105.0528	0.5190	54.5224 (267)
Energy for lighting	219.4033	0.5190	113.8703 (268)
Energy saving/generation technologies			
PV Unit	-397.2100	0.5190	-206.1520 (269)
Total CO2, kg/year			867.0297 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.6100 (273)

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

DER			18.6100 ZC1
Total Floor Area		TFA	46.5900
Assumed number of occupants		N	1.5904
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.6016 ZC2
CO2 emissions from cooking, equation (L16)			3.3735 ZC3
Total CO2 emissions			39.5850 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			39.5850 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.5900 (1b)	x 2.3400 (2b)	= 109.0206 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.0206 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4335 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3684 (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	0.4698	0.4605	0.4513	0.4053	0.3961	0.3500	0.3500	0.3408	0.3684	0.3961	0.4145	0.4329 (22b)
Effective ac	0.6103	0.6060	0.6019	0.5821	0.5784	0.5613	0.5613	0.5581	0.5679	0.5784	0.5859	0.5937 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.4800	1.3258	8.5909		(27)
TER Room Window (Uw = 1.70)			2.3600	1.5918	3.7566		(27a)
Exposed Floor to Stairwell			8.2100	0.1300	1.0673		(28b)
140mm Timber Frame	14.0700	1.6300	12.4400	0.1800	2.2392		(29a)
WTS	12.9200	2.1200	10.8000	0.1800	1.9440		(29a)
WTV	17.2300		17.2300	0.1800	3.1014		(29a)
Dormer Cheek	3.1000	1.2600	1.8400	0.1800	0.3312		(29a)
Timber Stud Wall	8.9000	3.5900	5.3100	0.1800	0.9558		(29a)
Rooflight Stud Wall	14.2200		14.2200	0.1800	2.5596		(29a)
400mm Mineral Wool	37.2100		37.2100	0.1300	4.8373		(30)
Sloping	7.1300		7.1300	0.1300	0.9269		(30)
Dormer Roof	1.5100		1.5100	0.1300	0.1963		(30)
Rooflight Sloping	2.5100	2.3600	0.1500	0.1300	0.0195		(30)
Total net area of external elements Aum(A, m ²)			127.0100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.6460		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7759 (36)
Total fabric heat loss						(33) + (36) =	51.4219 (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	21.9579	21.8037	21.6526	20.9430	20.8102	20.1921	20.1921	20.0777	20.4302	20.8102	21.0788	21.3596 (38)
Heat transfer coeff	73.3797	73.2256	73.0745	72.3649	72.2321	71.6140	71.6140	71.4995	71.8521	72.2321	72.5007	72.7815 (39)
Average = Sum(39)m / 12 =												72.3642 (39)
HLP	1.5750	1.5717	1.5685	1.5532	1.5504	1.5371	1.5371	1.5347	1.5422	1.5504	1.5561	1.5622 (40)
HLP (average)												1.5532 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5904 (42)
Average daily hot water use (litres/day)												71.9718 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	79.1690	76.2901	73.4112	70.5323	67.6535	64.7746	64.7746	67.6535	70.5323	73.4112	76.2901	79.1690 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Energy conte	117.4053	102.6834	105.9601	92.3786	88.6394	76.4891	70.8784	81.3340	82.3054	95.9190	104.7030	113.7007 (45)
Energy content (annual)										Total =	Sum(45)m =	1132.3962 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.6108	15.4025	15.8940	13.8568	13.2959	11.4734	10.6318	12.2001	12.3458	14.3878	15.7055	17.0551 (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	40.3436	35.1143	37.4095	34.7831	34.4755	31.9436	33.0084	34.4755	34.7831	37.4095	37.6225	40.3436 (61)
Total heat required for water heating calculated for each month												
	157.7489	137.7977	143.3696	127.1616	123.1149	108.4327	103.8868	115.8094	117.0884	133.3285	142.3256	154.0444 (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												
	157.7489	137.7977	143.3696	127.1616	123.1149	108.4327	103.8868	115.8094	117.0884	133.3285	142.3256	154.0444 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum(64)m =			1564.1086 (64)
	49.1232	42.9208	44.5841	39.4116	38.0915	33.4185	31.8192	35.6624	36.0623	41.2454	44.2194	47.8914 (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	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	12.4235	11.0345	8.9738	6.7938	5.0784	4.2874	4.6327	6.0218	8.0824	10.2625	11.9778	12.7688 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	138.3877	139.8237	136.2050	128.5011	118.7763	109.6364	103.5303	102.0943	105.7131	113.4170	123.1418	132.2817 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520 (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)												
	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156 (71)
Water heating gains (Table 5)												
	66.0258	63.8703	59.9249	54.7384	51.1982	46.4146	42.7677	47.9334	50.0865	55.4374	61.4158	64.3702 (72)
Total internal gains												
	266.6928	264.5843	254.9596	239.8891	224.9088	210.1943	200.7866	205.9053	213.7379	228.9727	246.3912	259.2765 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		W
North					1.6300	10.6334	0.6300	0.7000		0.7700		5.2970 (74)
West					4.8500	19.6403	0.6300	0.7000		0.7700		29.1113 (80)
East					1.5700	25.9287	0.6300	0.7000		1.0000		16.1570 (82)
West					0.7900	25.9287	0.6300	0.7000		1.0000		8.1300 (82)

Solar gains	58.6953	115.6624	193.7718	289.5983	362.3031	374.4287	354.9956	299.7822	227.4782	138.0009	73.3082	48.2061 (83)
Total gains	325.3881	380.2467	448.7314	529.4874	587.2119	584.6229	555.7822	505.6875	441.2161	366.9736	319.6994	307.4826 (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	44.0914	44.1842	44.2756	44.7098	44.7920	45.1786	45.1786	45.2509	45.0289	44.7920	44.6260	44.4538
alpha	3.9394	3.9456	3.9517	3.9807	3.9861	4.0119	4.0119	4.0167	4.0019	3.9861	3.9751	3.9636
util living area	0.9960	0.9922	0.9804	0.9419	0.8493	0.6935	0.5402	0.6047	0.8438	0.9697	0.9929	0.9968 (86)
MIT	19.3136	19.4993	19.8394	20.2922	20.6749	20.9003	20.9720	20.9565	20.7677	20.2572	19.7043	19.2821 (87)
Th 2	19.6317	19.6342	19.6365	19.6478	19.6499	19.6598	19.6598	19.6616	19.6560	19.6499	19.6457	19.6412 (88)
util rest of house												
	0.9946	0.9894	0.9730	0.9190	0.7904	0.5818	0.3885	0.4498	0.7582	0.9535	0.9898	0.9957 (89)
MIT 2	17.4356	17.7074	18.2009	18.8470	19.3470	19.5985	19.6510	19.6458	19.4777	18.8140	18.0151	17.3957 (90)
Living area fraction									fLA = Living area / (4) =			0.4602 (91)
MIT	18.2999	18.5320	18.9549	19.5121	19.9581	20.1976	20.2589	20.2490	20.0714	19.4781	18.7924	18.2638 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2999	18.5320	18.9549	19.5121	19.9581	20.1976	20.2589	20.2490	20.0714	19.4781	18.7924	18.2638 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9926	0.9861	0.9680	0.9162	0.8057	0.6298	0.4590	0.5216	0.7887	0.9507	0.9870	0.9940 (94)
Useful gains	322.9809	374.9785	434.3893	485.0943	473.0966	368.2098	255.0855	263.7682	348.0058	348.8916	315.5395	305.6478 (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												
	1027.3058	998.2120	910.1344	767.9396	596.4979	400.8639	262.0269	275.1990	429.0547	641.2854	847.7083	1023.5815 (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												
	524.0178	418.8129	353.9543	203.6486	91.8106	0.0000	0.0000	0.0000	0.0000	217.5410	383.1615	534.1426 (98)
Space heating												2727.0894 (98)
Space heating per m2										(98) / (4) =		58.5338 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
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													2919.7959 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	524.0178	418.8129	353.9543	203.6486	91.8106	0.0000	0.0000	0.0000	0.0000	217.5410	383.1615	534.1426	(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)	561.0469	448.4078	378.9661	218.0392	98.2983	0.0000	0.0000	0.0000	0.0000	232.9133	410.2372	571.8872	(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	157.7489	137.7977	143.3696	127.1616	123.1149	108.4327	103.8868	115.8094	117.0884	133.3285	142.3256	154.0444	(64)
Efficiency of water heater (217)m	87.8435	87.6701	87.2368	86.2309	84.3245	80.3000	80.3000	80.3000	80.3000	86.2764	87.4218	87.9245	(216)
Fuel for water heating, kWh/month	179.5795	157.1776	164.3453	147.4665	146.0013	135.0345	129.3734	144.2210	145.8137	154.5365	162.8032	175.2006	(219)
Water heating fuel used												1841.5530	(219)
Annual totals kWh/year													
Space heating fuel - main system													2919.7959 (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)													219.4033 (232)
Total delivered energy for all uses													5055.7523 (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	2919.7959	0.2160	630.6759 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1841.5530	0.2160	397.7755 (264)
Space and water heating			1028.4514 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	219.4033	0.5190	113.8703 (268)
Total CO2, kg/m2/year			1181.2467 (272)
Emissions per m2 for space and water heating			22.0745 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4441 (272b)
Emissions per m2 for pumps and fans			0.8355 (272c)
Target Carbon Dioxide Emission Rate (TER) = (22.0745 * 1.00) + 2.4441 + 0.8355, rounded to 2 d.p.			25.3500 (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	46.5900 (1b)	x 2.3400 (2b)	= 109.0206 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.0206 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1835 (8)
Pressure test					Yes
Measured/design AP50					4.4300
Infiltration rate					0.4050 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3442 (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												
	0.4389	0.4303	0.4217	0.3786	0.3700	0.3270	0.3270	0.3184	0.3442	0.3700	0.3872	0.4044 (22b)
Effective ac	0.5963	0.5926	0.5889	0.5717	0.5685	0.5535	0.5535	0.5507	0.5592	0.5685	0.5750	0.5818 (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
Window (Uw = 1.40)			4.3600	1.3258	5.7803		(27)
French Door (Uw = 1.40)			2.1200	1.3258	2.8106		(27)
DTC			2.1200	0.6300	1.3356		(26)
Roof Window (Uw = 1.80)			2.3600	1.6791	3.9627		(27a)
Exposed Floor to Stairwell			8.2100	0.1100	0.9031	20.0000	164.2000 (28b)
140mm Timber Frame	14.0700	1.6300	12.4400	0.1900	2.3636	9.0000	111.9600 (29a)
WTS	12.9200	2.1200	10.8000	0.1500	1.6200	18.0000	194.4000 (29a)
WTW	17.2300		17.2300	0.2200	3.7906	9.0000	155.0700 (29a)
Dormer Cheek	3.1000	1.2600	1.8400	0.3300	0.6072	9.0000	16.5600 (29a)
Timber Stud Wall	8.9000	3.5900	5.3100	0.2800	1.4868	9.0000	47.7900 (29a)
Rooflight Stud Wall	14.2200		14.2200	0.3000	4.2660	9.0000	127.9800 (29a)
400mm Mineral Wool	37.2100		37.2100	0.1100	4.0931	9.0000	334.8900 (30)
Sloping	7.1300		7.1300	0.2000	1.4260	9.0000	64.1700 (30)
Dormer Roof	1.5100		1.5100	0.2800	0.4228	9.0000	13.5900 (30)
Rooflight Sloping	2.5100	2.3600	0.1500	0.3000	0.0450	9.0000	1.3500 (30)
Total net area of external elements Aum(A, m ²)			127.0100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9134		(33)
Timber Frame			11.1400	0.0000	0.0000	20.0000	222.8000 (32)
Party Floor			38.3800			30.0000	1151.4000 (32d)
Timber			73.1400			9.0000	658.2600 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3264.4200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							70.0670 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.0402 (36)
Total fabric heat loss						(33) + (36) =	57.9536 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	21.4530	21.3185	21.1866	20.5672	20.4513	19.9119	19.9119	19.8120	20.1197	20.4513	20.6858	20.9309 (38)
	79.4066	79.2721	79.1402	78.5208	78.4049	77.8654	77.8654	77.7655	78.0732	78.4049	78.6394	78.8845 (39)
Average = Sum(39)m / 12 =												78.5203 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.7044	1.7015	1.6987	1.6854	1.6829	1.6713	1.6713	1.6691	1.6758	1.6829	1.6879	1.6932 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5904 (42)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Average daily hot water use (litres/day)												71.9718 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	79.1690	76.2901	73.4112	70.5323	67.6535	64.7746	64.7746	67.6535	70.5323	73.4112	76.2901	79.1690 (44)
Energy content (annual)	117.4053	102.6834	105.9601	92.3786	88.6394	76.4891	70.8784	81.3340	82.3054	95.9190	104.7030	113.7007 (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	1132.3962 (45)
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 (46)
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	24.9486	21.8202	22.5165	19.6304	18.8359	16.2539	15.0617	17.2835	17.4899	20.3828	22.2494	24.1614 (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	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.4235	11.0345	8.9738	6.7938	5.0784	4.2874	4.6327	6.0218	8.0824	10.2625	11.9778	12.7688 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.3877	139.8237	136.2050	128.5011	118.7763	109.6364	103.5303	102.0943	105.7131	113.4170	123.1418	132.2817 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520 (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)	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156 (71)
Water heating gains (Table 5)	33.5331	32.4706	30.2641	27.2645	25.3170	22.5749	20.2442	23.2305	24.2915	27.3962	30.9019	32.4750 (72)
Total internal gains	231.2002	230.1846	222.2988	209.4152	196.0276	183.3546	175.2631	178.2024	184.9428	197.9315	212.8774	224.3814 (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				1.6300	10.6334	0.7200	0.7000	0.7700		6.0537 (74)		
West				2.7300	19.6403	0.7200	0.7000	0.7700		18.7272 (80)		
West				2.1200	19.6403	0.7200	0.7000	0.7700		14.5428 (80)		
East				1.5700	25.9287	0.6300	0.7000	1.0000		16.1570 (82)		
West				0.7900	25.9287	0.6300	0.7000	1.0000		8.1300 (82)		

Solar gains	63.6108	125.2439	209.6270	313.0854	391.5671	404.6347	383.6482	324.0457	246.0149	149.3757	79.4271	52.2569 (83)
Total gains	294.8109	355.4285	431.9258	522.5006	587.5947	587.9893	558.9112	502.2481	430.9578	347.3072	292.3045	276.6383 (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	11.4195	11.4389	11.4579	11.5483	11.5654	11.6455	11.6455	11.6605	11.6145	11.5654	11.5309	11.4951
alpha	1.7613	1.7626	1.7639	1.7699	1.7710	1.7764	1.7764	1.7774	1.7743	1.7710	1.7687	1.7663
util living area	0.9441	0.9219	0.8807	0.8070	0.7057	0.5860	0.4791	0.5285	0.7084	0.8602	0.9270	0.9496 (86)
MIT	17.0831	17.4498	18.1259	19.0099	19.8146	20.4177	20.7167	20.6503	20.1176	19.0525	17.9071	17.0106 (87)
Th 2	19.5377	19.5398	19.5418	19.5513	19.5531	19.5615	19.5615	19.5630	19.5583	19.5531	19.5495	19.5457 (88)
util rest of house	0.9358	0.9104	0.8625	0.7759	0.6540	0.5018	0.3576	0.4083	0.6360	0.8306	0.9143	0.9421 (89)
MIT 2	16.0457	16.4075	17.0706	17.9285	18.6807	19.2159	19.4451	19.4079	18.9834	17.9945	16.8717	15.9793 (90)
Living area fraction	16.5231	16.8872	17.5562	18.4261	19.2025	19.7689	20.0303	19.9797	19.5054	18.4814	17.3482	16.4539 (92)
MIT	16.5231	16.8872	17.5562	18.4261	19.2025	19.7689	20.0303	19.9797	19.5054	18.4814	17.3482	16.4539 (93)
Temperature adjustment												0.0000
adjusted MIT	16.5231	16.8872	17.5562	18.4261	19.2025	19.7689	20.0303	19.9797	19.5054	18.4814	17.3482	16.4539 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9113	0.8816	0.8301	0.7463	0.6395	0.5153	0.4007	0.4468	0.6328	0.8020	0.8872	0.9191 (94)
Ext temp.	268.6693	313.3346	358.5337	389.9631	375.7484	302.9896	223.9824	224.4293	272.7213	278.5536	259.3310	254.2713 (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	970.5964	950.2485	874.9916	747.9984	588.2312	402.4824	267.1006	278.3747	422.0154	617.9376	805.9094	966.6396 (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	522.2338	428.0061	384.2447	257.7855	158.0871	0.0000	0.0000	0.0000	0.0000	252.5017	393.5364	530.0020 (98)
Space heating per m2												2926.3974 (98)
										(98) / (4) =		62.8117 (99)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	731.9352	576.2043	591.0181	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6347	0.6944	0.6579	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	464.5459	400.1123	388.8364	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	720.3029	686.6371	625.4221	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	184.1450	213.1745	176.0198	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												573.3393 (104)
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	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	46.0363	53.2936	44.0049	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												143.3348 (107)
Space cooling per m2												3.0765 (108)
Energy for space heating												62.8117 (99)
Energy for space cooling												3.0765 (108)
Total												65.8882 (109)
Dwelling Fabric Energy Efficiency (DFEE)												65.9 (109)

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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	46.5900 (1b)	x 2.3400 (2b)	= 109.0206 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.0206 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1835 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4335 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3684 (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	0.4698	0.4605	0.4513	0.4053	0.3961	0.3500	0.3500	0.3408	0.3684	0.3961	0.4145	0.4329 (22b)
Effective ac	0.6103	0.6060	0.6019	0.5821	0.5784	0.5613	0.5613	0.5581	0.5679	0.5784	0.5859	0.5937 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.40)			6.4800	1.3258	8.5909		(27)
TER Room Window (Uw = 1.70)			2.3600	1.5918	3.7566		(27a)
Exposed Floor to Stairwell			8.2100	0.1300	1.0673		(28b)
140mm Timber Frame	14.0700	1.6300	12.4400	0.1800	2.2392		(29a)
WTS	12.9200	2.1200	10.8000	0.1800	1.9440		(29a)
WTV	17.2300		17.2300	0.1800	3.1014		(29a)
Dormer Cheek	3.1000	1.2600	1.8400	0.1800	0.3312		(29a)
Timber Stud Wall	8.9000	3.5900	5.3100	0.1800	0.9558		(29a)
Rooflight Stud Wall	14.2200		14.2200	0.1800	2.5596		(29a)
400mm Mineral Wool	37.2100		37.2100	0.1300	4.8373		(30)
Sloping	7.1300		7.1300	0.1300	0.9269		(30)
Dormer Roof	1.5100		1.5100	0.1300	0.1963		(30)
Rooflight Sloping	2.5100	2.3600	0.1500	0.1300	0.0195		(30)
Total net area of external elements Aum(A, m ²)			127.0100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.6460		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							18.7759 (36)
Total fabric heat loss						(33) + (36) =	51.4219 (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	21.9579	21.8037	21.6526	20.9430	20.8102	20.1921	20.1921	20.0777	20.4302	20.8102	21.0788	21.3596 (38)
Heat transfer coeff	73.3797	73.2256	73.0745	72.3649	72.2321	71.6140	71.6140	71.4995	71.8521	72.2321	72.5007	72.7815 (39)
Average = Sum(39)m / 12 =												72.3642 (39)
HLP	1.5750	1.5717	1.5685	1.5532	1.5504	1.5371	1.5371	1.5347	1.5422	1.5504	1.5561	1.5622 (40)
HLP (average)												1.5532 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5904 (42)
Average daily hot water use (litres/day)												71.9718 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	79.1690	76.2901	73.4112	70.5323	67.6535	64.7746	64.7746	67.6535	70.5323	73.4112	76.2901	79.1690 (44)

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Energy content (annual)	117.4053	102.6834	105.9601	92.3786	88.6394	76.4891	70.8784	81.3340	82.3054	95.9190	104.7030	113.7007 (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	1132.3962 (45)
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)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	24.9486	21.8202	22.5165	19.6304	18.8359	16.2539	15.0617	17.2835	17.4899	20.3828	22.2494	24.1614 (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	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195	79.5195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.4235	11.0345	8.9738	6.7938	5.0784	4.2874	4.6327	6.0218	8.0824	10.2625	11.9778	12.7688 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.3877	139.8237	136.2050	128.5011	118.7763	109.6364	103.5303	102.0943	105.7131	113.4170	123.1418	132.2817 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520	30.9520 (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)	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156 (71)
Water heating gains (Table 5)	33.5331	32.4706	30.2641	27.2645	25.3170	22.5749	20.2442	23.2305	24.2915	27.3962	30.9019	32.4750 (72)
Total internal gains	231.2002	230.1846	222.2988	209.4152	196.0276	183.3546	175.2631	178.2024	184.9428	197.9315	212.8774	224.3814 (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				1.6300	10.6334	0.6300	0.7000			0.7700			5.2970 (74)
West				4.8500	19.6403	0.6300	0.7000			0.7700			29.1113 (80)
East				1.5700	25.9287	0.6300	0.7000			1.0000			16.1570 (82)
West				0.7900	25.9287	0.6300	0.7000			1.0000			8.1300 (82)

Solar gains	58.6953	115.6624	193.7718	289.5983	362.3031	374.4287	354.9956	299.7822	227.4782	138.0009	73.3082	48.2061 (83)	
Total gains	289.8955	345.8470	416.0706	499.0136	558.3307	557.7832	530.2586	477.9846	412.4210	335.9324	286.1855	272.5875 (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	44.0914	44.1842	44.2756	44.7098	44.7920	45.1786	45.1786	45.2509	45.0289	44.7920	44.6260	44.4538
alpha	3.9394	3.9456	3.9517	3.9807	3.9861	4.0119	4.0119	4.0167	4.0019	3.9861	3.9751	3.9636
util living area	0.9974	0.9944	0.9847	0.9512	0.8659	0.7153	0.5620	0.6316	0.8663	0.9772	0.9952	0.9980 (86)
MIT	19.2482	19.4368	19.7828	20.2470	20.6462	20.8882	20.9678	20.9492	20.7394	20.2054	19.6431	19.2174 (87)
Th 2	19.6317	19.6342	19.6365	19.6478	19.6499	19.6598	19.6598	19.6616	19.6560	19.6499	19.6457	19.6412 (88)
util rest of house	0.9964	0.9923	0.9788	0.9312	0.8105	0.6041	0.4062	0.4735	0.7868	0.9645	0.9931	0.9972 (89)
MIT 2	18.0673	18.2569	18.6014	19.0599	19.4213	19.6119	19.6527	19.6487	19.5154	19.0305	18.4719	18.0437 (90)
Living area fraction									fLA = Living area / (4) =			0.4602 (91)
MIT	18.6107	18.7999	19.1450	19.6062	19.9850	20.1993	20.2579	20.2471	20.0787	19.5712	19.0108	18.5838 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6107	18.7999	19.1450	19.6062	19.9850	20.1993	20.2579	20.2471	20.0787	19.5712	19.0108	18.5838 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9954	0.9906	0.9761	0.9304	0.8262	0.6524	0.4788	0.5472	0.8160	0.9635	0.9917	0.9964 (94)
Ext temp.	288.5755	342.6036	406.1073	464.3054	461.2793	363.9057	253.8923	261.5322	336.5536	323.6777	283.8032	271.6130 (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	1050.1165	1017.8263	924.0297	774.7517	598.4404	400.9856	261.9562	275.0678	429.5812	648.0070	863.5434	1046.8750 (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	566.5865	453.7496	385.3343	223.5214	102.0479	0.0000	0.0000	0.0000	0.0000	241.3010	417.4130	576.7949 (98)
Space heating per m2												2966.7486 (98)
										(98) / (4) =		63.6778 (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

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Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	673.1715	529.9436	543.3965	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8074	0.8744	0.8365	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	543.5075	463.3807	454.5424	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	684.9971	653.1471	597.0622	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	101.8725	141.1862	106.0347	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												349.0934	(104)
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	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.4681	35.2965	26.5087	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												87.2734	(107)
Space cooling per m2												1.8732	(108)
Energy for space heating												63.6778	(99)
Energy for space cooling												1.8732	(108)
Total												65.5510	(109)
Target Fabric Energy Efficiency (TFEE)												75.4	(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	46.5900 (1b)	x 2.3400 (2b)	= 109.0206 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.0206 (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								4.4300				
Infiltration rate								0.2215	(18)			
Number of sides sheltered								2	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1883	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Adj infilt rate	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
	0.2071	0.1930	0.1930	0.1836	0.1836	0.1742	0.1742	0.1647	0.1647	0.1789	0.1742	0.1836 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (Uw = 1.40)			4.3600	1.3258	5.7803		(27)					
French Door (Uw = 1.40)			2.1200	1.3258	2.8106		(27)					
DTC			2.1200	0.6300	1.3356		(26)					
Roof Window (Uw = 1.80)			2.3600	1.6791	3.9627		(27a)					
Exposed Floor to Stairwell			8.2100	0.1100	0.9031	20.0000	164.2000 (28b)					
140mm Timber Frame	14.0700	1.6300	12.4400	0.1900	2.3636	9.0000	111.9600 (29a)					
WTS	12.9200	2.1200	10.8000	0.1500	1.6200	18.0000	194.4000 (29a)					
WTV	17.2300		17.2300	0.2200	3.7906	9.0000	155.0700 (29a)					
Dormer Cheek	3.1000	1.2600	1.8400	0.3300	0.6072	9.0000	16.5600 (29a)					
Timber Stud Wall	8.9000	3.5900	5.3100	0.2800	1.4868	9.0000	47.7900 (29a)					
Rooflight Stud Wall	14.2200		14.2200	0.3000	4.2660	9.0000	127.9800 (29a)					
400mm Mineral Wool	37.2100		37.2100	0.1100	4.0931	9.0000	334.8900 (30)					
Sloping	7.1300		7.1300	0.2000	1.4260	9.0000	64.1700 (30)					
Dormer Roof	1.5100		1.5100	0.2800	0.4228	9.0000	13.5900 (30)					
Rooflight Sloping	2.5100	2.3600	0.1500	0.3000	0.0450	9.0000	1.3500 (30)					
Total net area of external elements Aum(A, m2)			127.0100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.9134	(33)					
Timebr Frame					0.0000	0.0000	(32)					
Party Floor						20.0000	222.8000 (32)					
Timber						30.0000	1151.4000 (32d)					
						9.0000	658.2600 (32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3264.4200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							70.0670 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.0402 (36)					
Total fabric heat loss					(33) + (36) =		57.9536 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.9884	Feb 17.9884	Mar 17.9884	Apr 17.9884	May 17.9884	Jun 17.9884	Jul 17.9884	Aug 17.9884	Sep 17.9884	Oct 17.9884	Nov 17.9884	Dec 17.9884 (38)
Heat transfer coeff	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420 (39)
Average = Sum(39)m / 12 =												75.9420 (39)
HLP	Jan 1.6300	Feb 1.6300	Mar 1.6300	Apr 1.6300	May 1.6300	Jun 1.6300	Jul 1.6300	Aug 1.6300	Sep 1.6300	Oct 1.6300	Nov 1.6300	Dec 1.6300 (40)
HLP (average)												1.6300 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5904 (42)
Average daily hot water use (litres/day)													71.9718 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	79.1690	76.2901	73.4112	70.5323	67.6535	64.7746	64.7746	67.6535	70.5323	73.4112	76.2901	79.1690	(44)
Energy content	117.4053	102.6834	105.9601	92.3786	88.6394	76.4891	70.8784	81.3340	82.3054	95.9190	104.7030	113.7007	(45)
Energy content (annual)													1132.3962 (45)
Distribution loss (46)m = 0.15 x (45)m													
	17.6108	15.4025	15.8940	13.8568	13.2959	11.4734	10.6318	12.2001	12.3458	14.3878	15.7055	17.0551	(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	14.4958	13.0761	14.4503	13.9538	14.3968	13.9069	14.3546	14.3820	13.9325	14.4282	13.9979	14.4870	(61)
Total heat required for water heating calculated for each month													
	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877	(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	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877	(64)
RHI water heating demand													1302.2580 (64)
Heat gains from water heating, kWh/month	42.6612	37.4113	38.8443	34.2043	33.0718	28.9094	27.1557	30.6390	30.8496	35.5001	38.3132	41.4272	(65)
													1302 (64)

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

Metabolic gains (Table 5), Watts													
(66)m	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	31.0588	27.5862	22.4346	16.9844	12.6960	10.7185	11.5818	15.0544	20.2060	25.6562	29.9445	31.9220	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.5488	208.6922	203.2910	191.7927	177.2781	163.6364	154.5229	152.3796	157.7807	169.2791	183.7937	197.4353	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	(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)													
	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	(71)
Water heating gains (Table 5)													
	57.3403	55.6715	52.2101	47.5060	44.4514	40.1519	36.4996	41.1815	42.8467	47.7152	53.2128	55.6818	(72)
Total internal gains	375.8885	372.8904	358.8762	337.2236	315.3660	295.4474	283.5448	289.5560	301.7740	323.5909	347.8916	365.9797	(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				1.6300	13.4839	0.7200	0.7000				0.7700			7.6766 (74)
West				2.7300	25.1925	0.7200	0.7000				0.7700			24.0214 (80)
West				2.1200	25.1925	0.7200	0.7000				0.7700			18.6540 (80)
East				1.5700	33.4886	0.6300	0.7000				1.0000			20.8679 (82)
West				0.7900	33.4886	0.6300	0.7000				1.0000			10.5004 (82)
Solar gains	81.7202	137.0610	231.0205	346.0005	407.9322	461.5210	422.4305	373.3119	283.9055	174.1214	101.7472			63.5188 (83)
Total gains	457.6087	509.9514	589.8967	683.2241	723.2982	756.9683	705.9753	662.8680	585.6794	497.7124	449.6387			429.4985 (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	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	
alpha	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	
util living area	0.8805	0.8554	0.7982	0.7048	0.5811	0.4231	0.3173	0.3342	0.5427	0.7385	0.8447	0.8895	(86)
MIT	17.9919	18.2663	18.8963	19.6387	20.3089	20.7420	20.8975	20.8881	20.5575	19.7845	18.7796	17.9410	(87)
Th 2	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	(88)
util rest of house	0.8641	0.8359	0.7703	0.6627	0.5158	0.3286	0.1941	0.2056	0.4496	0.6885	0.8195	0.8740	(89)
MIT 2	15.8422	16.2203	17.0844	18.0770	18.9326	19.4177	19.5550	19.5512	19.2474	18.3065	16.9460	15.7739	(90)
Living area fraction													
MIT	16.8315	17.1619	17.9182	18.7957	19.5659	20.0271	20.1728	20.1664	19.8503	18.9867	17.7898	16.7712	(91)
Temperature adjustment													
adjusted MIT	16.6815	17.0119	17.7682	18.6457	19.4159	19.8771	20.0228	20.0164	19.7003	18.8367	17.6398	16.6212	(92)

8. Space heating requirement

Utilisation	0.8173	0.7880	0.7249	0.6295	0.5067	0.3491	0.2340	0.2469	0.4576	0.6558	0.7731	0.8282	(94)
Useful gains	374.0115	401.8520	427.5988	430.0928	366.5069	264.2830	165.2039	163.6842	268.0079	326.4191	347.6238	355.6945	(95)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Ext temp.	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000 (96)
Heat loss rate W	856.7374	843.8566	772.1913	656.5693	479.6452	302.0291	176.3976	175.9131	334.1690	519.1889	701.6887	844.5637 (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	359.1481	297.0271	256.3768	163.0630	84.1750	0.0000	0.0000	0.0000	0.0000	143.4208	254.9267	363.7187 (98)
Space heating												1921.8562 (98)
RHI space heating demand												1922 (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	46.5900 (1b)	x 2.3400 (2b)	= 109.0206 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.0206 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 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									4.4300			
Infiltration rate									0.2215	(18)		
Number of sides sheltered									2	(19)		
Shelter factor							(20) = 1 -	[0.075 x (19)] =	0.8500	(20)		
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1883	(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 (22)
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 (22a)
	0.2401	0.2353	0.2306	0.2071	0.2024	0.1789	0.1789	0.1742	0.1883	0.2024	0.2118	0.2212 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Window (Uw = 1.40)			4.3600	1.3258	5.7803			(27)					
French Door (Uw = 1.40)			2.1200	1.3258	2.8106			(27)					
DTC			2.1200	0.6300	1.3356			(26)					
Roof Window (Uw = 1.80)			2.3600	1.6791	3.9627			(27a)					
Exposed Floor to Stairwell			8.2100	0.1100	0.9031	20.0000	164.2000	(28b)					
140mm Timber Frame	14.0700	1.6300	12.4400	0.1900	2.3636	9.0000	111.9600	(29a)					
WTS	12.9200	2.1200	10.8000	0.1500	1.6200	18.0000	194.4000	(29a)					
WTV	17.2300		17.2300	0.2200	3.7906	9.0000	155.0700	(29a)					
Dormer Cheek	3.1000	1.2600	1.8400	0.3300	0.6072	9.0000	16.5600	(29a)					
Timber Stud Wall	8.9000	3.5900	5.3100	0.2800	1.4868	9.0000	47.7900	(29a)					
Rooflight Stud Wall	14.2200		14.2200	0.3000	4.2660	9.0000	127.9800	(29a)					
400mm Mineral Wool	37.2100		37.2100	0.1100	4.0931	9.0000	334.8900	(30)					
Sloping	7.1300		7.1300	0.2000	1.4260	9.0000	64.1700	(30)					
Dormer Roof	1.5100		1.5100	0.2800	0.4228	9.0000	13.5900	(30)					
Rooflight Sloping	2.5100	2.3600	0.1500	0.3000	0.0450	9.0000	1.3500	(30)					
Total net area of external elements Aum(A, m2)			127.0100					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9134			(33)					
Timebr Frame			11.1400	0.0000	0.0000	20.0000	222.8000	(32)					
Party Floor			38.3800			30.0000	1151.4000	(32d)					
Timber			73.1400			9.0000	658.2600	(32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	3264.4200	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							70.0670	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.0402	(36)					
Total fabric heat loss						(33) + (36) =	57.9536	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 17.9884	Feb 17.9884	Mar 17.9884	Apr 17.9884	May 17.9884	Jun 17.9884	Jul 17.9884	Aug 17.9884	Sep 17.9884	Oct 17.9884	Nov 17.9884	Dec 17.9884	(38)
Heat transfer coeff	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	(39)
Average = Sum(39)m / 12 =												75.9420	(39)
HLP	Jan 1.6300	Feb 1.6300	Mar 1.6300	Apr 1.6300	May 1.6300	Jun 1.6300	Jul 1.6300	Aug 1.6300	Sep 1.6300	Oct 1.6300	Nov 1.6300	Dec 1.6300	(40)
HLP (average)												1.6300	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5904 (42)											
Average daily hot water use (litres/day)	71.9718 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	79.1690	76.2901	73.4112	70.5323	67.6535	64.7746	64.7746	67.6535	70.5323	73.4112	76.2901	79.1690 (44)
Energy content (annual)	117.4053	102.6834	105.9601	92.3786	88.6394	76.4891	70.8784	81.3340	82.3054	95.9190	104.7030	113.7007 (45)
Distribution loss (46)m = 0.15 x (45)m	17.6108	15.4025	15.8940	13.8568	13.2959	11.4734	10.6318	12.2001	12.3458	14.3878	15.7055	17.0551 (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	14.4958	13.0761	14.4503	13.9538	14.3968	13.9069	14.3546	14.3820	13.9325	14.4282	13.9979	14.4870 (61)
Total heat required for water heating calculated for each month	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877 (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	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877 (64)
Heat gains from water heating, kWh/month	42.6612	37.4113	38.8443	34.2043	33.0718	28.9094	27.1557	30.6390	30.8496	35.5001	38.3132	41.4272 (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	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0588	27.5862	22.4346	16.9844	12.6960	10.7185	11.5818	15.0544	20.2060	25.6562	29.9445	31.9220 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.5488	208.6922	203.2910	191.7927	177.2781	163.6364	154.5229	152.3796	157.7807	169.2791	183.7937	197.4353 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327 (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)	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156 (71)
Water heating gains (Table 5)	57.3403	55.6715	52.2101	47.5060	44.4514	40.1519	36.4996	41.1815	42.8467	47.7152	53.2128	55.6818 (72)
Total internal gains	375.8885	372.8904	358.8762	337.2236	315.3660	295.4474	283.5448	289.5560	301.7740	323.5909	347.8916	365.9797 (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				1.6300	10.6334	0.7200	0.7000	0.7700		6.0537 (74)		
West				2.7300	19.6403	0.7200	0.7000	0.7700		18.7272 (80)		
West				2.1200	19.6403	0.7200	0.7000	0.7700		14.5428 (80)		
East				1.5700	25.9287	0.6300	0.7000	1.0000		16.1570 (82)		
West				0.7900	25.9287	0.6300	0.7000	1.0000		8.1300 (82)		
Solar gains	63.6108	125.2439	209.6270	313.0854	391.5671	404.6347	383.6482	324.0457	246.0149	149.3757	79.4271	52.2569 (83)
Total gains	439.4992	498.1342	568.5032	650.3090	706.9331	700.0821	667.1930	613.6017	547.7889	472.9666	427.3187	418.2366 (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	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405
alpha	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960
util living area	0.8973	0.8714	0.8249	0.7465	0.6420	0.5219	0.4164	0.4569	0.6280	0.7903	0.8725	0.9051 (86)
MIT	17.6376	17.9658	18.5675	19.3322	20.0289	20.5358	20.7833	20.7346	20.3075	19.3993	18.3731	17.5476 (87)
Th 2	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914 (88)
util rest of house	0.8838	0.8547	0.8015	0.7110	0.5884	0.4409	0.3064	0.3463	0.5526	0.7524	0.8530	0.8925 (89)
MIT 2	15.3448	15.8003	16.6322	17.6708	18.5839	19.2045	19.4664	19.4273	18.9632	17.7948	16.3817	15.2199 (90)
Living area fraction	16.3999	16.7968	17.5228	18.4354	19.2489	19.8171	20.0724	20.0289	19.5818	18.5331	17.2981	16.2911 (92)
Temperature adjustment	16.2499	16.6468	17.3728	18.2854	19.0989	19.6671	19.9224	19.8789	19.4318	18.3831	17.1481	-0.1500
adjusted MIT	16.2499	16.6468	17.3728	18.2854	19.0989	19.6671	19.9224	19.8789	19.4318	18.3831	17.1481	16.1411 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8385	0.8071	0.7540	0.6714	0.5670	0.4456	0.3343	0.3709	0.5428	0.7113	0.8064	0.8484 (94)
Ext temp.	368.5195	402.0459	428.6673	436.6169	400.7963	311.9909	223.0178	227.6050	297.3247	336.4307	344.6040	354.8222 (95)
	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)

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Heat loss rate W	907.5009	892.0779	825.7018	712.7433	561.8846	384.8073	252.3091	264.1922	404.9103	591.0672	763.0733	906.8303 (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	401.0022	329.3015	295.3936	198.8110	119.8497	0.0000	0.0000	0.0000	0.0000	189.4496	301.2979	410.6941 (98)
Space heating												2245.7995 (98)
Space heating per m2											(98) / (4) =	48.2035 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
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												2481.5464 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	401.0022	329.3015	295.3936	198.8110	119.8497	0.0000	0.0000	0.0000	0.0000	189.4496	301.2979	410.6941 (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)	443.0963	363.8691	326.4018	219.6807	132.4306	0.0000	0.0000	0.0000	0.0000	209.3366	332.9258	453.8056 (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	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877 (64)
Efficiency of water heater	89.6863	89.6453	89.5495	89.3586	88.9920	87.3000	87.3000	87.3000	87.3000	89.2952	89.5721	87.3000 (216)
(217)m	89.6863	89.6453	89.5495	89.3586	88.9920	87.3000	87.3000	87.3000	87.3000	89.2952	89.5721	89.7177 (217)
Fuel for water heating, kWh/month	147.0693	129.1305	134.4624	118.9950	115.7814	103.5464	97.6323	109.6403	110.2380	123.5756	132.5201	142.8789 (219)
Water heating fuel used												1465.4703 (219)
Annual totals kWh/year												
Space heating fuel - main system												2481.5464 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.7450, total flow = 21.0000, SFP = 0.2260)												
mechanical ventilation fans (SFP = 0.2260)												30.0528 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												105.0528 (231)
Electricity for lighting (calculated in Appendix L)												219.4033 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												4271.4729 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2481.5464	3.4800	86.3578 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1465.4703	3.4800	50.9984 (247)
Mechanical ventilation fans	30.0528	13.1900	3.9640 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	219.4033	13.1900	28.9393 (249)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	13.1900	0.0000 (252)
Total energy cost			300.1520 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		1.3764 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	80.7993
SAP rating (Section 12)		81 (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	2481.5464	0.2160	536.0140 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1465.4703	0.2160	316.5416 (264)
Space and water heating			852.5556 (265)
Pumps and fans	105.0528	0.5190	54.5224 (267)
Energy for lighting	219.4033	0.5190	113.8703 (268)

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Energy saving/generation technologies			
PV Unit	-397.2100	0.5190	-206.1520 (269)
Total kg/year			814.7964 (272)
CO2 emissions per m2			17.4900 (273)
EI value			88.0792
EI rating			88 (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	$3.48 / 0.8875 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8875 = 0.2434$, stars = 4

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.5900 (1b)	x 2.3400 (2b)	= 109.0206 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 109.0206 (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							4.4300					
Infiltration rate							0.2215	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1883	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.4000	4.1000	4.1000	3.9000	3.9000	3.7000	3.7000	3.5000	3.5000	3.8000	3.7000	3.9000 (22)
Adj infilt rate	1.1000	1.0250	1.0250	0.9750	0.9750	0.9250	0.9250	0.8750	0.8750	0.9500	0.9250	0.9750 (22a)
	0.2071	0.1930	0.1930	0.1836	0.1836	0.1742	0.1742	0.1647	0.1647	0.1789	0.1742	0.1836 (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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (Uw = 1.40)			4.3600	1.3258	5.7803		(27)					
French Door (Uw = 1.40)			2.1200	1.3258	2.8106		(27)					
DTC			2.1200	0.6300	1.3356		(26)					
Roof Window (Uw = 1.80)			2.3600	1.6791	3.9627		(27a)					
Exposed Floor to Stairwell			8.2100	0.1100	0.9031	20.0000	164.2000 (28b)					
140mm Timber Frame	14.0700	1.6300	12.4400	0.1900	2.3636	9.0000	111.9600 (29a)					
WTS	12.9200	2.1200	10.8000	0.1500	1.6200	18.0000	194.4000 (29a)					
WTV	17.2300		17.2300	0.2200	3.7906	9.0000	155.0700 (29a)					
Dormer Cheek	3.1000	1.2600	1.8400	0.3300	0.6072	9.0000	16.5600 (29a)					
Timber Stud Wall	8.9000	3.5900	5.3100	0.2800	1.4868	9.0000	47.7900 (29a)					
Rooflight Stud Wall	14.2200		14.2200	0.3000	4.2660	9.0000	127.9800 (29a)					
400mm Mineral Wool	37.2100		37.2100	0.1100	4.0931	9.0000	334.8900 (30)					
Sloping	7.1300		7.1300	0.2000	1.4260	9.0000	64.1700 (30)					
Dormer Roof	1.5100		1.5100	0.2800	0.4228	9.0000	13.5900 (30)					
Rooflight Sloping	2.5100	2.3600	0.1500	0.3000	0.0450	9.0000	1.3500 (30)					
Total net area of external elements Aum(A, m2)			127.0100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9134		(33)					
Timebr Frame				11.1400	0.0000	0.0000	(32)					
Party Floor				38.3800		20.0000	222.8000 (32)					
Timber				73.1400		30.0000	1151.4000 (32d)					
						9.0000	658.2600 (32c)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			3264.4200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							70.0670 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.0402 (36)					
Total fabric heat loss				(33) + (36) =			57.9536 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.9884	Feb 17.9884	Mar 17.9884	Apr 17.9884	May 17.9884	Jun 17.9884	Jul 17.9884	Aug 17.9884	Sep 17.9884	Oct 17.9884	Nov 17.9884	Dec 17.9884 (38)
Heat transfer coeff	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420	75.9420 (39)
Average = Sum(39)m / 12 =	75.9420 (39)											
HLP	Jan 1.6300	Feb 1.6300	Mar 1.6300	Apr 1.6300	May 1.6300	Jun 1.6300	Jul 1.6300	Aug 1.6300	Sep 1.6300	Oct 1.6300	Nov 1.6300	Dec 1.6300 (40)
HLP (average)	1.6300 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.5904 (42)
Average daily hot water use (litres/day)													71.9718 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	79.1690	76.2901	73.4112	70.5323	67.6535	64.7746	64.7746	67.6535	70.5323	73.4112	76.2901	79.1690	(44)
Energy content	117.4053	102.6834	105.9601	92.3786	88.6394	76.4891	70.8784	81.3340	82.3054	95.9190	104.7030	113.7007	(45)
Energy content (annual)													1132.3962 (45)
Distribution loss (46)m = 0.15 x (45)m													
	17.6108	15.4025	15.8940	13.8568	13.2959	11.4734	10.6318	12.2001	12.3458	14.3878	15.7055	17.0551	(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	14.4958	13.0761	14.4503	13.9538	14.3968	13.9069	14.3546	14.3820	13.9325	14.4282	13.9979	14.4870	(61)
Total heat required for water heating calculated for each month													
	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877	(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	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877	(64)
Heat gains from water heating, kWh/month	42.6612	37.4113	38.8443	34.2043	33.0718	28.9094	27.1557	30.6390	30.8496	35.5001	38.3132	41.4272	(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	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	95.4234	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0588	27.5862	22.4346	16.9844	12.6960	10.7185	11.5818	15.0544	20.2060	25.6562	29.9445	31.9220	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.5488	208.6922	203.2910	191.7927	177.2781	163.6364	154.5229	152.3796	157.7807	169.2791	183.7937	197.4353	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	46.1327	(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)	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	-63.6156	(71)
Water heating gains (Table 5)	57.3403	55.6715	52.2101	47.5060	44.4514	40.1519	36.4996	41.1815	42.8467	47.7152	53.2128	55.6818	(72)
Total internal gains	375.8885	372.8904	358.8762	337.2236	315.3660	295.4474	283.5448	289.5560	301.7740	323.5909	347.8916	365.9797	(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					1.6300	13.4839	0.7200	0.7000			0.7700			7.6766 (74)
West					2.7300	25.1925	0.7200	0.7000			0.7700			24.0214 (80)
West					2.1200	25.1925	0.7200	0.7000			0.7700			18.6540 (80)
East					1.5700	33.4886	0.6300	0.7000			1.0000			20.8679 (82)
West					0.7900	33.4886	0.6300	0.7000			1.0000			10.5004 (82)

Solar gains	81.7202	137.0610	231.0205	346.0005	407.9322	461.5210	422.4305	373.3119	283.9055	174.1214	101.7472			63.5188 (83)
Total gains	457.6087	509.9514	589.8967	683.2241	723.2982	756.9683	705.9753	662.8680	585.6794	497.7124	449.6387			429.4985 (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	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	11.9405	
alpha	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	1.7960	
util living area	0.8805	0.8554	0.7982	0.7048	0.5811	0.4231	0.3173	0.3342	0.5427	0.7385	0.8447	0.8895	(86)
MIT	17.9919	18.2663	18.8963	19.6387	20.3089	20.7420	20.8975	20.8881	20.5575	19.7845	18.7796	17.9410	(87)
Th 2	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	19.5914	(88)
util rest of house	0.8641	0.8359	0.7703	0.6627	0.5158	0.3286	0.1941	0.2056	0.4496	0.6885	0.8195	0.8740	(89)
MIT 2	15.8422	16.2203	17.0844	18.0770	18.9326	19.4177	19.5550	19.5512	19.2474	18.3065	16.9460	15.7739	(90)
Living area fraction													
MIT	16.8315	17.1619	17.9182	18.7957	19.5659	20.0271	20.1728	20.1664	19.8503	18.9867	17.7898	16.7712	(92)
Temperature adjustment													-0.1500
adjusted MIT	16.6815	17.0119	17.7682	18.6457	19.4159	19.8771	20.0228	20.0164	19.7003	18.8367	17.6398	16.6212	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8173	0.7880	0.7249	0.6295	0.5067	0.3491	0.2340	0.2469	0.4576	0.6558	0.7731	0.8282	(94)
Useful gains	374.0115	401.8520	427.5988	430.0928	366.5069	264.2830	165.2039	163.6842	268.0079	326.4191	347.6238	355.6945	(95)
Ext temp.	5.4000	5.9000	7.6000	10.0000	13.1000	15.9000	17.7000	17.7000	15.3000	12.0000	8.4000	5.5000	(96)

FULL SAP CALCULATION PRINTOUT

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

Heat loss rate W	856.7374	843.8566	772.1913	656.5693	479.6452	302.0291	176.3976	175.9131	334.1690	519.1889	701.6887	844.5637 (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	359.1481	297.0271	256.3768	163.0630	84.1750	0.0000	0.0000	0.0000	0.0000	143.4208	254.9267	363.7187 (98)
Space heating												1921.8562 (98)
Space heating per m2											(98) / (4) =	41.2504 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
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												2123.5980 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.1481	297.0271	256.3768	163.0630	84.1750	0.0000	0.0000	0.0000	0.0000	143.4208	254.9267	363.7187 (98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000 (210)
Space heating fuel (main heating system)	396.8487	328.2067	283.2893	180.1802	93.0110	0.0000	0.0000	0.0000	0.0000	158.4760	281.6870	401.8991 (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	131.9010	115.7595	120.4103	106.3323	103.0362	90.3960	85.2330	95.7160	96.2378	110.3471	118.7010	128.1877 (64)
Efficiency of water heater	89.6176	89.5792	89.4522	89.2093	88.7103	87.3000	87.3000	87.3000	87.3000	89.0802	89.4582	87.3000 (216)
(217)m	89.6176	89.5792	89.4522	89.2093	88.7103	87.3000	87.3000	87.3000	87.3000	89.0802	89.4582	89.6437 (217)
Fuel for water heating, kWh/month	147.1820	129.2259	134.6086	119.1942	116.1491	103.5464	97.6323	109.6403	110.2380	123.8740	132.6887	142.9969 (219)
Water heating fuel used												1466.9764 (219)
Annual totals kWh/year												
Space heating fuel - main system												2123.5980 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.7450, total flow = 21.0000, SFP = 0.2260)												
mechanical ventilation fans (SFP = 0.2260)												30.0528 (230a)
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												105.0528 (231)
Electricity for lighting (calculated in Appendix L)												219.4033 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
Total delivered energy for all uses												3915.0305 (238)

10a. Fuel costs - using BEDF prices (524)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2123.5980	10.2300	217.2441 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1466.9764	10.2300	150.0717 (247)
Mechanical ventilation fans	30.0528	36.7200	11.0354 (249)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	219.4033	36.7200	80.5649 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	36.7200	0.0000 (252)
Total energy cost			589.4561 (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	2123.5980	0.2160	458.6972 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1466.9764	0.2160	316.8669 (264)
Space and water heating			775.5641 (265)
Pumps and fans	105.0528	0.5190	54.5224 (267)
Energy for lighting	219.4033	0.5190	113.8703 (268)
Energy saving/generation technologies			
PV Unit	-397.2100	0.5190	-206.1520 (269)
Total kg/year			737.8048 (272)

13a. Primary energy - Individual heating systems including micro-CHP

Energy Primary energy factor Primary energy

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	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	2123.5980	1.2200	2590.7895 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1466.9764	1.2200	1789.7112 (264)
Space and water heating			4380.5007 (265)
Pumps and fans	105.0528	3.0700	322.5122 (267)
Energy for lighting	219.4033	3.0700	673.5682 (268)
Energy saving/generation technologies			
PV Unit	-397.2100	3.0700	-1219.4347 (269)
Primary energy kWh/year			4157.1464 (272)
Primary energy kWh/m2/year			89.2283 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 81
Current environmental impact rating: B 88

(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: (none) SAP change Cost change CO2 change

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)	Total Savings £0 0.00 kg/m²		

Potential energy efficiency rating: B 81
Potential environmental impact rating: B 88

Fuel prices for cost data on this page from database revision number 524 TEST (01 Aug 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£119	£119	£0
Mains gas	£470	£470	£0
Space heating	£359	£359	£0
Water heating	£150	£150	£0
Lighting	£81	£81	£0
Total cost of fuels	£589	£589	£0
Total cost of uses	£590	£590	£0
Delivered energy	84 kWh/m²	84 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 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 EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

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	SemiDetached Flat
Number of storeys	1
Cross ventilation possible	No
SAP Region	Southern England
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	70.1 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	143.91 (P1)
Transmission heat loss coefficient	57.95 (37)
Summer heat loss coefficient	201.86 (P2)

Overhangs Orientation	Ratio	Z_overhangs	Overhang type
North	0.000	1.000	None
West	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	1.00	1.000	1.000 (P8)
West	1.000	0.90	1.000	0.900 (P8)
West	1.000	1.00	1.000	1.000 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	1.6300	87.1704	0.7200	0.7000	0.9000	58.0059
West	2.7300	125.2818	0.7200	0.7000	0.9000	139.6259
West	2.1200	125.2818	0.7200	0.7000	0.9000	108.4275
East	1.5700	188.6220	0.6300	0.7000	1.0000	117.5366
West	0.7900	188.6220	0.6300	0.7000	1.0000	59.1426
total:						482.7386

	Jun	Jul	Aug	
Solar gains	521	483	418	(P3)
Internal gains	292	281	287	
Total summer gains	814	763	704	(P5)
Summer gain/loss ratio	4.03	3.78	3.49	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 70.1)	1.51	1.51	1.51	
Threshold temperature	20.94	22.59	22.59	(P7)
Likelihood of high internal temperature	Slight	Medium	Medium	
Assessment of likelihood of high internal temperature:	Medium			