

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2 Bed 1F Apartment (ASHP+PV)				Issued on Date	15/12/2022
Assessment Reference	088	Prop Type Ref	1F Apartment-Det-As			
Property	FOG, Plot 089, 2 Bed, K, B					
SAP Rating	92 A	DER	11.04	TER	31.74	
Environmental	93 A	% DER<TER	65.21			
CO ₂ Emissions (t/year)	0.46	DFEE	49.83	TFEE	62.80	
General Requirements Compliance	Pass	% DFEE<TFEE	20.66			
Assessor Details	Mr. Christopher MacDougall, Chris MacDougall, Tel: 02032 902 902, chris.macdougall@aessc.co.uk				Assessor ID	Q920-0001
Client						

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 62 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:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 31.74 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 49.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.26 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.19 (max. 0.25)	0.19 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.40 (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:	4.01 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Vaillant aroTHERM 8kW VWL 85/3 A 230v

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.56 kWh/day	
Permitted by DBSCG 2.24	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	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 (Thames Valley):	Slight	OK
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Based on:

Overshading:	Average
Windows facing South East:	1.68 m ² , No overhang
Windows facing South West:	3.06 m ² , No overhang
Windows facing North West:	5.95 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.90 W/m ² K
Photovoltaic array	1.20 kW

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	61.6600 (1b)	x 2.3100 (2b)	= 142.4346 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4346 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.0100
Infiltration rate					0.2005 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1855 (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	0.2365	0.2318	0.2272	0.2040	0.1994	0.1762	0.1762	0.1716	0.1855	0.1994	0.2086	0.2179 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.8900	1.1450	7.8893		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
E-FC-14			48.9800	0.1900	9.3062	117.0000	5730.6600 (28b)
E-FC-14 over bin store			15.6900	0.1900	2.9811	117.0000	1835.7300 (28b)
100mm Knauf Supafil 34	59.4100	10.6900	48.7200	0.2600	12.6672	52.8000	2572.4160 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			141.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			42.7421	(33)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			118.6300			9.0000	1067.6700 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =			15559.4240	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						252.3423	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						8.0473	(36)
Total fabric heat loss			(33) + (36) =			50.7894	(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	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017 (38)
Heat transfer coeff	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911 (39)
Average = Sum(39)m / 12 =												74.2911 (39)
HLP	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049 (40)
HLP (average)												1.2049 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0282 (42)
Average daily hot water use (litres/day)												82.3688 (43)
Daily hot water use	90.6057	87.3109	84.0162	80.7214	77.4267	74.1319	74.1319	77.4267	80.7214	84.0162	87.3109	90.6057 (44)
Energy conte	134.3656	117.5170	121.2670	105.7235	101.4442	87.5387	81.1174	93.0834	94.1951	109.7754	119.8284	130.1259 (45)

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Energy content (annual)												Total = Sum (45)m =	1295.9816 (45)
Distribution loss (46)m = 0.15 x (45)m													
	20.1548	17.6275	18.1901	15.8585	15.2166	13.1308	12.1676	13.9625	14.1293	16.4663	17.9743	19.5189	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8424	(55)
Total storage loss													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	183.7424	162.1154	170.6438	153.5075	150.8210	135.3227	130.4942	142.4602	141.9791	159.1522	167.6124	179.5027	(62)
WWHRS	-42.0986	-37.0362	-37.8031	-31.1385	-28.9310	-23.8795	-20.2333	-24.4900	-25.1939	-31.1195	-36.0131	-40.6824	eq. (G10)
Total of WWHRS savings												-378.6190	
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	141.6438	125.0792	132.8407	122.3690	121.8901	111.4432	110.2609	117.9702	116.7852	128.0327	131.5993	138.8203	(64)
Heat gains from water heating, kWh/month	84.1780	74.7531	79.8227	73.3803	73.2316	67.3338	66.4730	70.4517	69.5471	76.0017	78.0701	82.7683	(65)
Total per year (kWh/year) = Sum (64)m =												1498.7346	(64)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2284	14.4139	11.7222	8.8745	6.6338	5.6005	6.0515	7.8660	10.5578	13.4055	15.6462	16.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1132	178.9511	174.3197	164.4600	152.0139	140.3163	132.5016	130.6637	135.2951	145.1548	157.6009	169.2985	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	(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)	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	(71)
Water heating gains (Table 5)	113.1425	111.2398	107.2886	101.9170	98.4296	93.5192	89.3454	94.6931	96.5932	102.1529	108.4308	111.2477	(72)
Total internal gains	359.9065	358.0272	346.7529	328.6739	310.4997	292.8584	281.3210	286.6453	295.8685	314.1356	335.1003	350.6481	(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
Southeast				1.6800	36.7938	0.4600	0.0000			0.7700			21.8944 (77)
Southwest				3.0600	36.7938	0.4600	0.0000			0.7700			39.8791 (79)
Northwest				2.1500	11.2829	0.4600	0.0000			0.7700			8.5923 (81)
Northwest				3.8000	11.2829	0.4300	0.0000			0.7700			14.1960 (81)
Solar gains	84.5617	151.6092	227.5439	315.6379	384.3005	395.0516	375.2413	321.9474	257.7251	172.9815	102.6639	71.4753 (83)	
Total gains	444.4682	509.6364	574.2968	644.3118	694.8002	687.9100	656.5622	608.5926	553.5935	487.1171	437.7642	422.1233 (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	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	
alpha	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	
util living area	0.9957	0.9910	0.9777	0.9350	0.8275	0.6514	0.4894	0.5463	0.7965	0.9583	0.9912	0.9967	(86)
Tweekday	18.3413	18.5741	18.9522	19.4104	19.7540	19.8905	19.9133	19.9108	19.8352	19.4013	18.7765	18.2774	
Tweekend	20.2276	20.3312	20.5009	20.7131	20.8878	20.9735	20.9946	20.9910	20.9306	20.7040	20.4205	20.1993	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	19.8079	19.9655	20.2297	20.5520	20.8268	20.9594	20.9917	20.9861	20.8917	20.5432	20.0952	19.7642	(87)
Th 2	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	(88)
util rest of house	0.9943	0.9880	0.9700	0.9123	0.7721	0.5572	0.3733	0.4252	0.7138	0.9389	0.9877	0.9955	(89)
Tweekday	18.3413	18.5741	18.9522	19.4104	19.7540	19.8905	19.9133	19.9108	19.8352	19.4013	18.7765	18.2774	
Tweekend	18.3413	18.5741	18.9522	19.4104	19.7540	19.8905	19.9133	19.9108	19.8352	19.4013	18.7765	18.2774	
MIT 2	18.3413	18.5741	18.9522	19.4104	19.7540	19.8905	19.9133	19.9108	19.8352	19.4013	18.7765	18.2774	(90)
Living area fraction												0.4011	(91)
MIT	18.9295	19.1321	19.4646	19.8683	20.1843	20.3192	20.3458	20.3421	20.2589	19.8593	19.3054	18.8737	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9295	19.1321	19.4646	19.8683	20.1843	20.3192	20.3458	20.3421	20.2589	19.8593	19.3054	18.8737	(93)

8. Space heating requirement

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

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Utilisation	0.9924	0.9851	0.9660	0.9111	0.7871	0.5937	0.4201	0.4741	0.7425	0.9376	0.9850	0.9940 (94)
Useful gains	441.1009	502.0269	554.7525	587.0153	546.8724	408.4341	275.8300	288.5182	411.0456	456.7193	431.1853	419.5867 (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	1086.8411	1057.3201	963.1521	814.8451	630.3049	424.8860	278.2799	292.8619	457.5520	687.8841	906.7494	1090.1271 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	480.4307	373.1570	303.8493	164.0374	62.0738	0.0000	0.0000	0.0000	0.0000	171.9866	342.4062	498.8821 (98)
Space heating												2396.8230 (98)
Space heating per m2												(98) / (4) = 38.8716 (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 %)												219.2255 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												1093.3140 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	480.4307	373.1570	303.8493	164.0374	62.0738	0.0000	0.0000	0.0000	0.0000	171.9866	342.4062	498.8821 (98)
Space heating efficiency (main heating system 1)	219.2255	219.2255	219.2255	219.2255	219.2255	0.0000	0.0000	0.0000	0.0000	219.2255	219.2255	219.2255 (210)
Space heating fuel (main heating system)	219.1491	170.2161	138.6013	74.8259	28.3150	0.0000	0.0000	0.0000	0.0000	78.4519	156.1890	227.5657 (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	141.6438	125.0792	132.8407	122.3690	121.8901	111.4432	110.2609	117.9702	116.7852	128.0327	131.5993	138.8203 (64)
Efficiency of water heater												170.2800 (216)
(217)m	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (217)
Fuel for water heating, kWh/month	83.1829	73.4550	78.0131	71.8634	71.5821	65.4470	64.7527	69.2801	68.5842	75.1895	77.2840	81.5247 (219)
Water heating fuel used												880.1589 (219)
Annual totals kWh/year												
Space heating fuel - main system												1093.3140 (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)												39.2638 (230a)
Total electricity for the above, kWh/year												39.2638 (231)
Electricity for lighting (calculated in Appendix L)												286.5989 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.20 * 1029 * 1.00) =										-988.0192		-988.0192 (233)
Total delivered energy for all uses												1311.3163 (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	1093.3140	0.5190	567.4300 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	880.1589	0.5190	456.8025 (264)
Space and water heating			1024.2324 (265)
Pumps and fans	39.2638	0.5190	20.3779 (267)
Energy for lighting	286.5989	0.5190	148.7448 (268)
Energy saving/generation technologies			
PV Unit	-988.0192	0.5190	-512.7820 (269)
Total CO2, kg/year			680.5732 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.0400 (273)

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

DER			11.0400 ZC1
Total Floor Area		TFA	61.6600
Assumed number of occupants		N	2.0282
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.0213 ZC2
CO2 emissions from cooking, equation (L16)			2.7194 ZC3
Total CO2 emissions			30.7807 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			30.7807 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6600 (1b)	x 2.3100 (2b)	= 142.4346 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4346 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1404 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3904 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3611 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4604	0.4514	0.4424	0.3972	0.3882	0.3431	0.3431	0.3340	0.3611	0.3882	0.4063	0.4243 (22b)
Effective ac	0.6060	0.6019	0.5979	0.5789	0.5754	0.5589	0.5589	0.5558	0.5652	0.5754	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.9800	1.0000	1.9800		(26)					
TER Opening Type (Uw = 1.40)			10.6900	1.3258	14.1723		(27)					
E-FC-14			48.9800	0.1300	6.3674		(28b)					
E-FC-14 over bin store			15.6900	0.1300	2.0397		(28b)					
100mm Knauf Supafil 34	59.4100	10.6900	48.7200	0.1800	8.7696		(29a)					
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1800	2.7288		(29a)					
Total net area of external elements Aum(A, m2)			141.2200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0578		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.3336 (36)					
Total fabric heat loss						(33) + (36) =	53.3914 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.4843	28.2908	28.1012	27.2104	27.0437	26.2679	26.2679	26.1242	26.5668	27.0437	27.3809	27.7334 (38)
Heat transfer coeff	81.8758	81.6823	81.4926	80.6019	80.4352	79.6594	79.6594	79.5157	79.9582	80.4352	80.7724	81.1248 (39)
Average = Sum(39)m / 12 =												80.6011 (39)
HLP	1.3279	1.3247	1.3216	1.3072	1.3045	1.2919	1.2919	1.2896	1.2968	1.3045	1.3100	1.3157 (40)
HLP (average)												1.3072 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0282 (42)
Average daily hot water use (litres/day)												82.3688 (43)
Daily hot water use	90.6057	87.3109	84.0162	80.7214	77.4267	74.1319	74.1319	77.4267	80.7214	84.0162	87.3109	90.6057 (44)
Energy conte	134.3656	117.5170	121.2670	105.7235	101.4442	87.5387	81.1174	93.0834	94.1951	109.7754	119.8284	130.1259 (45)
Energy content (annual)										Total = Sum(45)m =		1295.9816 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.1548	17.6275	18.1901	15.8585	15.2166	13.1308	12.1676	13.9625	14.1293	16.4663	17.9743	19.5189	(46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	185.2916	163.5147	172.1931	155.0068	152.3703	136.8220	132.0435	144.0095	143.4784	160.7014	169.1117	181.0520 (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	185.2916	163.5147	172.1931	155.0068	152.3703	136.8220	132.0435	144.0095	143.4784	160.7014	169.1117	181.0520 (64)
								Total per year (kWh/year) =	Sum (64)m =			1895.5950 (64)
Heat gains from water heating, kWh/month	85.4174	75.8726	81.0621	74.5797	74.4711	68.5332	67.7124	71.6911	70.7465	77.2412	79.2696	84.0077 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2284	14.4139	11.7222	8.8745	6.6338	5.6005	6.0515	7.8660	10.5578	13.4055	15.6462	16.6795 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1132	178.9511	174.3197	164.4600	152.0139	140.3163	132.5016	130.6637	135.2951	145.1548	157.6009	169.2985 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408 (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)	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264 (71)
Water heating gains (Table 5)	114.8083	112.9056	108.9545	103.5829	100.0955	95.1851	91.0113	96.3590	98.2591	103.8188	110.0966	112.9136 (72)
Total internal gains	364.5724	362.6931	351.4188	333.3398	315.1656	297.5243	285.9868	291.3111	300.5343	318.8015	339.7662	355.3140 (73)

[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			
Southeast				1.6800	36.7938	0.6300	0.7000	0.7700	18.8911 (77)			
Southwest				3.0600	36.7938	0.6300	0.7000	0.7700	34.4087 (79)			
Northwest				5.9500	11.2829	0.6300	0.7000	0.7700	20.5169 (81)			
Solar gains	73.8166	132.5519	199.4648	277.4875	338.5029	348.2366	330.6678	283.2853	226.1907	151.3787	89.6564	62.3686 (83)
Total gains	438.3890	495.2450	550.8836	610.8273	653.6685	645.7609	616.6547	574.5964	526.7251	470.1802	429.4225	417.6826 (84)

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	52.2981	52.4219	52.5439	53.1246	53.2347	53.7532	53.7532	53.8503	53.5523	53.2347	53.0125	52.7822
alpha	4.4865	4.4948	4.5029	4.5416	4.5490	4.5835	4.5835	4.5900	4.5702	4.5490	4.5342	4.5188
util living area	0.9959	0.9922	0.9826	0.9518	0.8703	0.7127	0.5492	0.6049	0.8389	0.9668	0.9921	0.9967 (86)
MIT	19.6268	19.7841	20.0542	20.4167	20.7346	20.9264	20.9824	20.9730	20.8371	20.4341	19.9688	19.6004 (87)
Th 2	19.8191	19.8215	19.8239	19.8352	19.8373	19.8472	19.8472	19.8490	19.8434	19.8373	19.8330	19.8286 (88)
util rest of house	0.9945	0.9896	0.9762	0.9332	0.8203	0.6132	0.4149	0.4688	0.7601	0.9503	0.9888	0.9956 (89)
MIT 2	18.0155	18.2459	18.6384	19.1599	19.5806	19.7993	19.8410	19.8384	19.7155	19.1946	18.5241	17.9835 (90)
Living area fraction									fLa = Living area / (4) =			0.4011 (91)
MIT	18.6617	18.8629	19.2063	19.6640	20.0435	20.2513	20.2988	20.2934	20.1653	19.6918	19.1035	18.6320 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6617	18.8629	19.2063	19.6640	20.0435	20.2513	20.2988	20.2934	20.1653	19.6918	19.1035	18.6320 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9925	0.9866	0.9718	0.9298	0.8304	0.6505	0.4692	0.5238	0.7850	0.9476	0.9860	0.9939 (94)
Useful gains	435.0876	488.5840	535.3656	567.9684	542.8115	420.0764	289.3465	300.9631	413.4906	445.5465	423.3975	415.1244 (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	1175.8784	1140.5179	1035.4672	867.5958	671.1073	450.1824	294.6440	309.5893	484.9713	731.2968	969.5523	1170.7933 (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	551.1484	438.0996	372.0756	215.7317	95.4521	0.0000	0.0000	0.0000	0.0000	212.5982	393.2314	562.2176 (98)
Space heating												2840.5546 (98)
Space heating per m2										(98) / (4) =		46.0680 (99)

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3038.0263 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	551.1484	438.0996	372.0756	215.7317	95.4521	0.0000	0.0000	0.0000	0.0000	212.5982	393.2314	562.2176 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	589.4635	468.5557	397.9418	230.7291	102.0878	0.0000	0.0000	0.0000	0.0000	227.3778	420.5684	601.3023 (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	185.2916	163.5147	172.1931	155.0068	152.3703	136.8220	132.0435	144.0095	143.4784	160.7014	169.1117	181.0520 (64)
Efficiency of water heater (217)m	87.5465	87.3178	86.8171	85.6958	83.6074	79.8000	79.8000	79.8000	79.8000	85.5612	86.9922	79.8000 (216)
Fuel for water heating, kWh/month	211.6494	187.2638	198.3400	180.8803	182.2451	171.4561	165.4681	180.4630	179.7976	187.8204	194.3987	206.5916 (219)
Water heating fuel used												2246.3741 (219)
Annual totals kWh/year												
Space heating fuel - main system												3038.0263 (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)												286.5989 (232)
Total delivered energy for all uses												5645.9993 (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	3038.0263	0.2160	656.2137 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2246.3741	0.2160	485.2168 (264)
Space and water heating			1141.4305 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	286.5989	0.5190	148.7448 (268)
Total CO2, kg/m2/year			1329.1003 (272)
Emissions per m2 for space and water heating			18.5117 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4123 (272b)
Emissions per m2 for pumps and fans			0.6313 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.5117 * 1.55) + 2.4123 + 0.6313, rounded to 2 d.p.			31.7400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	61.6600 (1b)	x 2.3100 (2b)	= 142.4346 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4346 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1404 (8)
Measured/design AP50					Yes
Infiltration rate					4.0100
Number of sides sheltered					0.3409 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3153 (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												
	0.4021	0.3942	0.3863	0.3469	0.3390	0.2996	0.2996	0.2917	0.3153	0.3390	0.3548	0.3705 (22b)
Effective ac	0.5808	0.5777	0.5746	0.5602	0.5575	0.5449	0.5449	0.5425	0.5497	0.5575	0.5629	0.5686 (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
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.8900	1.1450	7.8893		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
E-FC-14			48.9800	0.1900	9.3062	117.0000	5730.6600 (28b)
E-FC-14 over bin store			15.6900	0.1900	2.9811	117.0000	1835.7300 (28b)
100mm Knauf Supafil 34	59.4100	10.6900	48.7200	0.2600	12.6672	52.8000	2572.4160 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			141.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7421		(33)
E-FC-4			50.7500			30.0000	1522.5000 (32b)
Timber partition			118.6300			9.0000	1067.6700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13529.4240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							219.4198 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0473 (36)
Total fabric heat loss						(33) + (36) =	50.7894 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.3009	27.1534	27.0088	26.3296	26.2025	25.6109	25.6109	25.5014	25.8388	26.2025	26.4596	26.7284 (38)
Heat transfer coeff	78.0903	77.9428	77.7982	77.1190	76.9919	76.4003	76.4003	76.2908	76.6282	76.9919	77.2490	77.5177 (39)
Average = Sum(39)m / 12 =												77.1184 (39)
HLP	1.2665	1.2641	1.2617	1.2507	1.2487	1.2391	1.2391	1.2373	1.2428	1.2487	1.2528	1.2572 (40)
HLP (average)												1.2507 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0282 (42)
Average daily hot water use (litres/day)												82.3688 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.6057	87.3109	84.0162	80.7214	77.4267	74.1319	74.1319	77.4267	80.7214	84.0162	87.3109	90.6057 (44)
Energy conte	134.3656	117.5170	121.2670	105.7235	101.4442	87.5387	81.1174	93.0834	94.1951	109.7754	119.8284	130.1259 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total = Sum(45)m =												1295.9816 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	(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	(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	(59)
Heat gains from water heating, kWh/month	28.5527	24.9724	25.7692	22.4662	21.5569	18.6020	17.2375	19.7802	20.0165	23.3273	25.4635	27.6517 (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	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2284	14.4139	11.7222	8.8745	6.6338	5.6005	6.0515	7.8660	10.5578	13.4055	15.6462	16.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1132	178.9511	174.3197	164.4600	152.0139	140.3163	132.5016	130.6637	135.2951	145.1548	157.6009	169.2985	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	(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)	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	(71)
Water heating gains (Table 5)	38.3773	37.1612	34.6361	31.2031	28.9743	25.8361	23.1686	26.5863	27.8007	31.3539	35.3660	37.1663	(72)
Total internal gains	285.1413	283.9487	274.1004	257.9600	241.0444	225.1753	215.1442	218.5385	227.0759	243.3366	262.0355	276.5667	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Southeast	1.6800	36.7938	0.4600	0.0000	0.7700	21.8944	(77)
Southwest	3.0600	36.7938	0.4600	0.0000	0.7700	39.8791	(79)
Northwest	2.1500	11.2829	0.4600	0.0000	0.7700	8.5923	(81)
Northwest	3.8000	11.2829	0.4300	0.0000	0.7700	14.1960	(81)

Solar gains	84.5617	151.6092	227.5439	315.6379	384.3005	395.0516	375.2413	321.9474	257.7251	172.9815	102.6639	71.4753	(83)
Total gains	369.7030	435.5579	501.6443	573.5979	625.3449	620.2269	590.3854	540.4858	484.8010	416.3181	364.6995	348.0420	(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	48.1260	48.2171	48.3067	48.7322	48.8126	49.1906	49.1906	49.2612	49.0443	48.8126	48.6501	48.4815	
alpha	4.2084	4.2145	4.2204	4.2488	4.2542	4.2794	4.2794	4.2841	4.2696	4.2542	4.2433	4.2321	
util living area	0.9964	0.9924	0.9816	0.9472	0.8602	0.7040	0.5462	0.6094	0.8436	0.9693	0.9932	0.9972	(86)
MIT	19.4584	19.6441	19.9518	20.3557	20.7055	20.9134	20.9773	20.9643	20.8018	20.3433	19.8246	19.4234	(87)
Th 2	19.8672	19.8691	19.8709	19.8796	19.8813	19.8889	19.8889	19.8903	19.8859	19.8813	19.8780	19.8745	(88)
util rest of house	0.9953	0.9901	0.9756	0.9292	0.8126	0.6110	0.4192	0.4803	0.7724	0.9555	0.9907	0.9964	(89)
MIT 2	18.4707	18.6568	18.9626	19.3611	19.6800	19.8473	19.8826	19.8792	19.7719	19.3575	18.8443	18.4414	(90)
Living area fraction									fLA = Living area / (4) =			0.4011	(91)
MIT	18.8668	19.0528	19.3593	19.7600	20.0913	20.2748	20.3217	20.3144	20.1850	19.7529	19.2374	18.8353	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8668	19.0528	19.3593	19.7600	20.0913	20.2748	20.3217	20.3144	20.1850	19.7529	19.2374	18.8353	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9940	0.9879	0.9722	0.9269	0.8226	0.6455	0.4704	0.5322	0.7941	0.9535	0.9888	0.9953	(94)
Useful gains	367.4938	430.2674	487.6852	531.6504	514.4286	400.3532	277.7315	287.6329	384.9929	396.9443	360.6167	346.4141	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1137.5280	1103.1067	1000.4323	837.5131	646.0623	433.5597	284.3370	298.6344	466.2789	704.6992	937.6045	1134.4940	(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	572.9055	452.1480	381.4838	220.2212	97.9355	0.0000	0.0000	0.0000	0.0000	228.9696	415.4312	586.3315	(98)
Space heating												2955.4263	(98)
Space heating per m2												(98) / (4) =	47.9310 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	718.1629	565.3623	579.8097	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8519	0.9101	0.8817	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	611.8187	514.5314	511.2135	0.0000	0.0000	0.0000	0.0000	(102)

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Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	800.7736	764.4150	707.3343	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	136.0475	185.9134	145.9139	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												467.8748 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	34.0119	46.4784	36.4785	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												116.9687 (107)
Space cooling per m2												1.8970 (108)
Energy for space heating												47.9310 (99)
Energy for space cooling												1.8970 (108)
Total												49.8280 (109)
Dwelling Fabric Energy Efficiency (DFEE)												49.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	61.6600 (1b)	x 2.3100 (2b)	= 142.4346 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4346 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1404 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3904 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3611 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4604	0.4514	0.4424	0.3972	0.3882	0.3431	0.3431	0.3340	0.3611	0.3882	0.4063	0.4243 (22b)
	0.6060	0.6019	0.5979	0.5789	0.5754	0.5589	0.5589	0.5558	0.5652	0.5754	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.9800	1.0000	1.9800		(26)					
TER Opening Type (Uw = 1.40)			10.6900	1.3258	14.1723		(27)					
E-FC-14			48.9800	0.1300	6.3674		(28b)					
E-FC-14 over bin store			15.6900	0.1300	2.0397		(28b)					
100mm Knauf Supafil 34	59.4100	10.6900	48.7200	0.1800	8.7696		(29a)					
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1800	2.7288		(29a)					
Total net area of external elements Aum(A, m2)			141.2200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	36.0578		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.3336 (36)					
Total fabric heat loss						(33) + (36) =	53.3914 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.4843	28.2908	28.1012	27.2104	27.0437	26.2679	26.2679	26.1242	26.5668	27.0437	27.3809	27.7334 (38)
Heat transfer coeff	81.8758	81.6823	81.4926	80.6019	80.4352	79.6594	79.6594	79.5157	79.9582	80.4352	80.7724	81.1248 (39)
Average = Sum(39)m / 12 =												80.6011 (39)
HLP	1.3279	1.3247	1.3216	1.3072	1.3045	1.2919	1.2919	1.2896	1.2968	1.3045	1.3100	1.3157 (40)
HLP (average)												1.3072 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0282 (42)
Average daily hot water use (litres/day)												82.3688 (43)
Daily hot water use	90.6057	87.3109	84.0162	80.7214	77.4267	74.1319	74.1319	77.4267	80.7214	84.0162	87.3109	90.6057 (44)
Energy conte	134.3656	117.5170	121.2670	105.7235	101.4442	87.5387	81.1174	93.0834	94.1951	109.7754	119.8284	130.1259 (45)
Energy content (annual)										Total = Sum(45)m =		1295.9816 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	28.5527	24.9724	25.7692	22.4662	21.5569	18.6020	17.2375	19.7802	20.0165	23.3273	25.4635	27.6517 (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	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	101.4080	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.2284	14.4139	11.7222	8.8745	6.6338	5.6005	6.0515	7.8660	10.5578	13.4055	15.6462	16.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1132	178.9511	174.3197	164.4600	152.0139	140.3163	132.5016	130.6637	135.2951	145.1548	157.6009	169.2985	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	33.1408	(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)	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	(71)
Water heating gains (Table 5)	38.3773	37.1612	34.6361	31.2031	28.9743	25.8361	23.1686	26.5863	27.8007	31.3539	35.3660	37.1663	(72)
Total internal gains	285.1413	283.9487	274.1004	257.9600	241.0444	225.1753	215.1442	218.5385	227.0759	243.3366	262.0355	276.5667	(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		
Southeast				1.6800	36.7938	0.6300	0.7000	0.7700		18.8911 (77)		
Southwest				3.0600	36.7938	0.6300	0.7000	0.7700		34.4087 (79)		
Northwest				5.9500	11.2829	0.6300	0.7000	0.7700		20.5169 (81)		
Solar gains	73.8166	132.5519	199.4648	277.4875	338.5029	348.2366	330.6678	283.2853	226.1907	151.3787	89.6564	62.3686 (83)
Total gains	358.9579	416.5006	473.5652	535.4475	579.5473	573.4119	545.8120	501.8237	453.2667	394.7153	351.6919	338.9353 (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	52.2981	52.4219	52.5439	53.1246	53.2347	53.7532	53.7532	53.8503	53.5523	53.2347	53.0125	52.7822	
alpha	4.4865	4.4948	4.5029	4.5416	4.5490	4.5835	4.5835	4.5900	4.5702	4.5490	4.5342	4.5188	
util living area	0.9982	0.9961	0.9902	0.9693	0.9069	0.7696	0.6092	0.6731	0.8908	0.9824	0.9964	0.9986	(86)
MIT	19.5114	19.6712	19.9473	20.3244	20.6704	20.8982	20.9733	20.9584	20.7805	20.3352	19.8570	19.4854	(87)
Th 2	19.8191	19.8215	19.8239	19.8352	19.8373	19.8472	19.8472	19.8490	19.8434	19.8373	19.8330	19.8286	(88)
util rest of house	0.9975	0.9947	0.9864	0.9564	0.8658	0.6730	0.4657	0.5305	0.8258	0.9728	0.9949	0.9981	(89)
MIT 2	18.4727	18.6339	18.9102	19.2884	19.6110	19.7995	19.8405	19.8371	19.7174	19.3054	18.8287	18.4542	(90)
Living area fraction	18.8893	19.0499	19.3261	19.7039	20.0359	20.2402	20.2948	20.2868	20.1438	19.7184	19.2411	18.8678	(91)
MIT	18.8893	19.0499	19.3261	19.7039	20.0359	20.2402	20.2948	20.2868	20.1438	19.7184	19.2411	18.8678	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8893	19.0499	19.3261	19.7039	20.0359	20.2402	20.2948	20.2868	20.1438	19.7184	19.2411	18.8678	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9968	0.9935	0.9843	0.9546	0.8740	0.7090	0.5241	0.5885	0.8457	0.9715	0.9938	0.9975	(94)
Ext temp.	357.8156	413.7794	466.1410	511.1564	506.5204	406.5517	286.0670	295.3143	383.3317	383.4719	349.5270	338.1028	(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	1194.5097	1155.7981	1045.2365	870.8142	670.5016	449.2932	294.3267	309.0611	483.2496	733.4437	980.6689	1189.9199	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	622.5004	498.6366	430.8471	258.9536	122.0020	0.0000	0.0000	0.0000	0.0000	260.3790	454.4221	633.7519	(98)
												3281.4928	(98)
												53.2191	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	748.7980	589.4793	604.3192	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8194	0.8890	0.8565	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	613.5595	524.0480	517.5808	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	746.0548	712.3163	662.1448	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	95.3966	140.0716	107.5556	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												343.0238	(104)

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Calculation Type: New Build (As Designed)



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Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.8491	35.0179	26.8889	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												85.7559 (107)
Space cooling per m2												1.3908 (108)
Energy for space heating												53.2191 (99)
Energy for space cooling												1.3908 (108)
Total												54.6099 (109)
Target Fabric Energy Efficiency (TFEE)												62.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	61.6600 (1b)	x 2.3100 (2b)	= 142.4346 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4346 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.0100
Infiltration rate					0.2005 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1855 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1947	0.1855	0.1855	0.1716	0.1716	0.1530	0.1576	0.1484	0.1530	0.1623	0.1623	0.1762 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.8900	1.1450	7.8893		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
E-FC-14			48.9800	0.1900	9.3062	117.0000	5730.6600 (28b)
E-FC-14 over bin store			15.6900	0.1900	2.9811	117.0000	1835.7300 (28b)
100mm Knauf Supafil 34	59.4100	10.6900	48.7200	0.2600	12.6672	52.8000	2572.4160 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			141.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7421		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			118.6300			9.0000	1067.6700 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15559.4240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							252.3423 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0473 (36)
Total fabric heat loss							(33) + (36) = 50.7894 (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	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017 (38)
Heat transfer coeff	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911 (39)
Average = Sum(39)m / 12 =												74.2911 (39)
HLP	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049 (40)
HLP (average)												1.2049 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0282 (42)
Average daily hot water use (litres/day)												82.3688 (43)
Daily hot water use	90.6057	87.3109	84.0162	80.7214	77.4267	74.1319	74.1319	77.4267	80.7214	84.0162	87.3109	90.6057 (44)
Energy conte	134.3656	117.5170	121.2670	105.7235	101.4442	87.5387	81.1174	93.0834	94.1951	109.7754	119.8284	130.1259 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1295.9816 (45)
Distribution loss (46)m = 0.15 x (45)m													
	20.1548	17.6275	18.1901	15.8585	15.2166	13.1308	12.1676	13.9625	14.1293	16.4663	17.9743	19.5189	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8424	(55)
Total storage loss													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	183.7424	162.1154	170.6438	153.5075	150.8210	135.3227	130.4942	142.4602	141.9791	159.1522	167.6124	179.5027	(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													
	183.7424	162.1154	170.6438	153.5075	150.8210	135.3227	130.4942	142.4602	141.9791	159.1522	167.6124	179.5027	(64)
Total per year (kWh/year) = Sum(64)m =												1877.3536	(64)
												1877	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month													
	84.1780	74.7531	79.8227	73.3803	73.2316	67.3338	66.4730	70.4517	69.5471	76.0017	78.0701	82.7683	(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	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5710	36.0348	29.3055	22.1861	16.5844	14.0013	15.1288	19.6651	26.3944	33.5137	39.1155	41.6986	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	264.3481	267.0912	260.1787	245.4627	226.8864	209.4273	197.7636	195.0205	201.9330	216.6490	235.2253	252.6844	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	(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)													
	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	(71)
Water heating gains (Table 5)													
	113.1425	111.2398	107.2886	101.9170	98.4296	93.5192	89.3454	94.6931	96.5932	102.1529	108.4308	111.2477	(72)
Total internal gains	507.8219	504.1261	486.5331	459.3262	431.6608	406.7081	391.9982	399.1390	414.6809	442.0759	472.5318	495.3910	(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			
Southeast				1.6800	40.4699	0.4600	0.0000	0.7700	24.0819 (77)			
Southwest				3.0600	40.4699	0.4600	0.0000	0.7700	43.8634 (79)			
Northwest				2.1500	12.9236	0.4600	0.0000	0.7700	9.8417 (81)			
Northwest				3.8000	12.9236	0.4300	0.0000	0.7700	16.2602 (81)			
Solar gains	94.0471	152.1767	226.7937	325.9636	387.7474	426.8769	400.9774	351.1527	279.0853	185.7266	117.0645	78.6711 (83)
Total gains	601.8690	656.3028	713.3268	785.2898	819.4081	833.5850	792.9755	750.2916	693.7662	627.8026	589.5963	574.0621 (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	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	
alpha	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	
util living area	0.9814	0.9705	0.9382	0.8495	0.6763	0.4408	0.2899	0.3161	0.5965	0.8709	0.9629	0.9846	(86)
Tweekday	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	
Tweekend	20.4284	20.5092	20.6699	20.8476	20.9611	20.9961	20.9996	20.9994	20.9835	20.8533	20.6147	20.4038	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.1179	20.2408	20.4905	20.7620	20.9400	20.9940	20.9994	20.9991	20.9743	20.7735	20.3984	20.0799	(87)
Th 2	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	(88)
util rest of house	0.9755	0.9614	0.9191	0.8068	0.6014	0.3477	0.1888	0.2094	0.4959	0.8232	0.9494	0.9796	(89)
Tweekday	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	
Tweekend	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	
MIT 2	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	(90)
Living area fraction												fLA = Living area / (4) =	0.4011 (91)
MIT	19.3225	19.4782	19.7863	20.1102	20.2992	20.3470	20.3506	20.3504	20.3322	20.1273	19.6821	19.2748	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3225	19.4782	19.7863	20.1102	20.2992	20.3470	20.3506	20.3504	20.3322	20.1273	19.6821	19.2748	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9713	0.9568	0.9164	0.8152	0.6290	0.3851	0.2294	0.2523	0.5358	0.8336	0.9458	0.9757	(94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Useful gains	584.6037	627.9761	653.6756	640.1561	515.4163	320.9961	181.9471	189.2997	371.7369	523.3475	557.6300	560.1359 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W												
Month fracti	1056.6072	1031.0297	920.1945	758.5256	542.2643	322.9408	182.0541	189.4717	381.2794	633.5046	867.8743	1053.0588 (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	351.1705	270.8520	198.2900	85.2261	19.9749	0.0000	0.0000	0.0000	0.0000	81.9568	223.3759	366.7347 (98)
RHI space heating demand												1597.5809 (98)
												1598 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	61.6600 (1b)	x 2.3100 (2b)	= 142.4346 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4346 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.0100
Infiltration rate					0.2005 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1855 (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	0.2365	0.2318	0.2272	0.2040	0.1994	0.1762	0.1762	0.1716	0.1855	0.1994	0.2086	0.2179 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.8900	1.1450	7.8893		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
E-FC-14			48.9800	0.1900	9.3062	117.0000	5730.6600 (28b)
E-FC-14 over bin store			15.6900	0.1900	2.9811	117.0000	1835.7300 (28b)
100mm Knauf Supafil 34	59.4100	10.6900	48.7200	0.2600	12.6672	52.8000	2572.4160 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			141.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7421		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			118.6300			9.0000	1067.6700 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15559.4240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							252.3423 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0473 (36)
Total fabric heat loss							(33) + (36) = 50.7894 (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	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017 (38)
Heat transfer coeff	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911 (39)
Average = Sum(39)m / 12 =												74.2911 (39)
HLP	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049 (40)
HLP (average)												1.2049 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0282 (42)
Average daily hot water use (litres/day)												82.3688 (43)
Daily hot water use	90.6057	87.3109	84.0162	80.7214	77.4267	74.1319	74.1319	77.4267	80.7214	84.0162	87.3109	90.6057 (44)
Energy conte	134.3656	117.5170	121.2670	105.7235	101.4442	87.5387	81.1174	93.0834	94.1951	109.7754	119.8284	130.1259 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)	Total = Sum(45)m = 1295.9816 (45)										
Distribution loss (46)m = 0.15 x (45)m											
	20.1548	17.6275	18.1901	15.8585	15.2166	13.1308	12.1676	13.9625	14.1293	16.4663	19.5189 (46)
Water storage loss:											
Store volume	200.0000 (47)										
a) If manufacturer declared loss factor is known (kWh/day):	1.5600 (48)										
Temperature factor from Table 2b	0.5400 (49)										
Enter (49) or (54) in (55)	0.8424 (55)										
Total storage loss											
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720 (56)
If cylinder contains dedicated solar storage											
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120 (59)
Total heat required for water heating calculated for each month											
	183.7424	162.1154	170.6438	153.5075	150.8210	135.3227	130.4942	142.4602	141.9791	159.1522	167.6124 (62)
WWHRS	-42.0986	-37.0362	-37.8031	-31.1385	-28.9310	-23.8795	-20.2333	-24.4900	-25.1939	-31.1195	-40.6824 eq. (G10)
Total of WWHRS savings	-378.6190										
Solar input	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	141.6438	125.0792	132.8407	122.3690	121.8901	111.4432	110.2609	117.9702	116.7852	128.0327	131.5993 (64)
Heat gains from water heating, kWh/month	84.1780	74.7531	79.8227	73.3803	73.2316	67.3338	66.4730	70.4517	69.5471	76.0017	78.0701 (65)
	Total per year (kWh/year) = Sum(64)m = 1498.7346 (64)										

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	40.5710	36.0348	29.3055	22.1861	16.5844	14.0013	15.1288	19.6651	26.3944	33.5137	39.1155	41.6986 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	264.3481	267.0912	260.1787	245.4627	226.8864	209.4273	197.7636	195.0205	201.9330	216.6490	235.2253	252.6844 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971 (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)												
	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264 (71)
Water heating gains (Table 5)												
	113.1425	111.2398	107.2886	101.9170	98.4296	93.5192	89.3454	94.6931	96.5932	102.1529	108.4308	111.2477 (72)
Total internal gains	507.8219	504.1261	486.5331	459.3262	431.6608	406.7081	391.9982	399.1390	414.6809	442.0759	472.5318	495.3910 (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
Southeast				1.6800	36.7938	0.4600	0.0000			0.7700			21.8944 (77)
Southwest				3.0600	36.7938	0.4600	0.0000			0.7700			39.8791 (79)
Northwest				2.1500	11.2829	0.4600	0.0000			0.7700			8.5923 (81)
Northwest				3.8000	11.2829	0.4300	0.0000			0.7700			14.1960 (81)
Solar gains	84.5617	151.6092	227.5439	315.6379	384.3005	395.0516	375.2413	321.9474	257.7251	172.9815	102.6639	71.4753 (83)	
Total gains	592.3836	655.7354	714.0770	774.9641	815.9612	801.7597	767.2394	721.0863	672.4060	615.0574	575.1957	566.8663 (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	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774
alpha	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785
util living area	0.9856	0.9752	0.9502	0.8851	0.7544	0.5732	0.4222	0.4673	0.7019	0.9092	0.9737	0.9883 (86)
Tweekday	18.6468	18.8615	19.1948	19.5689	19.8162	19.9020	19.9147	19.9135	19.8738	19.5785	19.0446	18.5799
Tweekend	20.3644	20.4613	20.6141	20.7939	20.9270	20.9847	20.9972	20.9954	20.9606	20.7935	20.5426	20.3343
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.0190	20.1667	20.4045	20.6781	20.8874	20.9764	20.9956	20.9929	20.9385	20.6812	20.2858	19.9726 (87)
Th 2	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161 (88)
util rest of house	0.9812	0.9677	0.9351	0.8517	0.6922	0.4846	0.3202	0.3606	0.6139	0.8749	0.9643	0.9846 (89)
Tweekday	18.6468	18.8615	19.1948	19.5689	19.8162	19.9020	19.9147	19.9135	19.8738	19.5785	19.0446	18.5799
Tweekend	18.6468	18.8615	19.1948	19.5689	19.8162	19.9020	19.9147	19.9135	19.8738	19.5785	19.0446	18.5799
MIT 2	18.6468	18.8615	19.1948	19.5689	19.8162	19.9020	19.9147	19.9135	19.8738	19.5785	19.0446	18.5799 (90)
Living area fraction	fLA = Living area / (4) = 0.4011 (91)											
MIT	19.1971	19.3850	19.6800	20.0138	20.2458	20.3329	20.3482	20.3464	20.3009	20.0208	19.5424	19.1384 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1971	19.3850	19.6800	20.0138	20.2458	20.3329	20.3482	20.3464	20.3009	20.0208	19.5424	19.1384 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Utilisation	0.9774	0.9631	0.9312	0.8551	0.7122	0.5196	0.3613	0.4036	0.6469	0.8787	0.9602	0.9812 (94)
Useful gains	578.9938	631.5642	664.9616	662.6428	581.1678	416.5583	277.1918	291.0171	434.9605	540.4629	552.3146	556.1984 (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	1106.7243	1076.1028	979.1555	825.6533	634.8769	425.9055	278.4585	293.1846	460.6680	699.8778	924.3596	1109.7918 (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	392.6315	298.7300	233.7602	117.3676	39.9595	0.0000	0.0000	0.0000	0.0000	118.6046	267.8724	411.8735 (98)
Space heating												1880.7993 (98)
Space heating per m2												(98) / (4) = 30.5027 (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 %)												219.2255 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												857.9291 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	392.6315	298.7300	233.7602	117.3676	39.9595	0.0000	0.0000	0.0000	0.0000	118.6046	267.8724	411.8735 (98)
Space heating efficiency (main heating system 1)	219.2255	219.2255	219.2255	219.2255	219.2255	0.0000	0.0000	0.0000	0.0000	219.2255	219.2255	219.2255 (210)
Space heating fuel (main heating system)	179.0994	136.2661	106.6300	53.5374	18.2276	0.0000	0.0000	0.0000	0.0000	54.1017	122.1904	187.8766 (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	141.6438	125.0792	132.8407	122.3690	121.8901	111.4432	110.2609	117.9702	116.7852	128.0327	131.5993	138.8203 (64)
Efficiency of water heater												170.2800 (216)
(217)m	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (217)
Fuel for water heating, kWh/month	83.1829	73.4550	78.0131	71.8634	71.5821	65.4470	64.7527	69.2801	68.5842	75.1895	77.2840	81.5247 (219)
Water heating fuel used												880.1589 (219)
Annual totals kWh/year												
Space heating fuel - main system												857.9291 (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)												39.2638 (230a)
Total electricity for the above, kWh/year												39.2638 (231)
Electricity for lighting (calculated in Appendix L)												286.5989 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.20 * 1029 * 1.00) =										-988.0192		-988.0192 (233)
Total delivered energy for all uses												1075.9315 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	857.9291	13.1900	113.1608 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	880.1589	13.1900	116.0930 (247)
Mechanical ventilation fans	39.2638	13.1900	5.1789 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	286.5989	13.1900	37.8024 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-988.0192	13.1900	-130.3197 (252)
Total energy cost			141.9154 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.5588 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	92.2044
SAP rating (Section 12)		92 (258)
SAP band		A

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	857.9291	0.5190	445.2652 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	880.1589	0.5190	456.8025 (264)
Space and water heating			902.0677 (265)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Pumps and fans	39.2638	0.5190	20.3779 (267)
Energy for lighting	286.5989	0.5190	148.7448 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-988.0192	0.5190	-512.7820 (269)
CO2 emissions per m2			558.4084 (272)
EI value			9.0600 (273)
EI rating			92.9846
EI band			93 (274)
			A

----- Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 2.1923 = 6.017$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 2.1923 = 0.2367$, stars = 4
Water heating energy efficiency	$13.19 / 1.7028 = 7.746$, stars = 3
Water heating environmental impact	$0.519 / 1.7028 = 0.3048$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	61.6600 (1b)	x 2.3100 (2b)	= 142.4346 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.4346 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					4.0100
Number of sides sheltered					0.2005 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1855 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.1947	0.1855	0.1855	0.1716	0.1716	0.1530	0.1576	0.1484	0.1530	0.1623	0.1623	0.1762 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.8900	1.1450	7.8893		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
E-FC-14			48.9800	0.1900	9.3062	117.0000	5730.6600 (28b)
E-FC-14 over bin store			15.6900	0.1900	2.9811	117.0000	1835.7300 (28b)
100mm Knauf Supafil 34	59.4100	10.6900	48.7200	0.2600	12.6672	52.8000	2572.4160 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			141.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7421		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			118.6300			9.0000	1067.6700 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15559.4240 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							252.3423 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0473 (36)
Total fabric heat loss							(33) + (36) = 50.7894 (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	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017	23.5017 (38)
Heat transfer coeff	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911	74.2911 (39)
Average = Sum(39)m / 12 =												74.2911 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049	1.2049 (40)
HLP (average)												1.2049 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0282 (42)
Average daily hot water use (litres/day)												82.3688 (43)
Daily hot water use	90.6057	87.3109	84.0162	80.7214	77.4267	74.1319	74.1319	77.4267	80.7214	84.0162	87.3109	90.6057 (44)
Energy conte	134.3656	117.5170	121.2670	105.7235	101.4442	87.5387	81.1174	93.0834	94.1951	109.7754	119.8284	130.1259 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)												Total = Sum(45)m =	1295.9816 (45)
Distribution loss (46)m = 0.15 x (45)m													
	20.1548	17.6275	18.1901	15.8585	15.2166	13.1308	12.1676	13.9625	14.1293	16.4663	17.9743	19.5189	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8424	(55)
Total storage loss													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(56)
If cylinder contains dedicated solar storage													
	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	183.7424	162.1154	170.6438	153.5075	150.8210	135.3227	130.4942	142.4602	141.9791	159.1522	167.6124	179.5027	(62)
WWHRS	-42.0986	-37.0362	-37.8031	-31.1385	-28.9310	-23.8795	-20.2333	-24.4900	-25.1939	-31.1195	-36.0131	-40.6824	eq. (G10)
Total of WWHRS savings												-378.6190	
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	141.6438	125.0792	132.8407	122.3690	121.8901	111.4432	110.2609	117.9702	116.7852	128.0327	131.5993	138.8203	(64)
Heat gains from water heating, kWh/month	84.1780	74.7531	79.8227	73.3803	73.2316	67.3338	66.4730	70.4517	69.5471	76.0017	78.0701	82.7683	(65)
Total per year (kWh/year) = Sum(64)m =												1498.7346	(64)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	121.6895	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5710	36.0348	29.3055	22.1861	16.5844	14.0013	15.1288	19.6651	26.3944	33.5137	39.1155	41.6986	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	264.3481	267.0912	260.1787	245.4627	226.8864	209.4273	197.7636	195.0205	201.9330	216.6490	235.2253	252.6844	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	49.1971	(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)													
	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	-81.1264	(71)
Water heating gains (Table 5)													
	113.1425	111.2398	107.2886	101.9170	98.4296	93.5192	89.3454	94.6931	96.5932	102.1529	108.4308	111.2477	(72)
Total internal gains	507.8219	504.1261	486.5331	459.3262	431.6608	406.7081	391.9982	399.1390	414.6809	442.0759	472.5318	495.3910	(73)

6. Solar gains

[Jan]													
	Area	Solar flux		g		FF		Access		Gains			
	m2	Table 6a		or Table 6b		or Table 6c		factor		W			
		W/m2						Table 6d					
Southeast	1.6800	40.4699		0.4600		0.0000		0.7700		24.0819		(77)	
Southwest	3.0600	40.4699		0.4600		0.0000		0.7700		43.8634		(79)	
Northwest	2.1500	12.9236		0.4600		0.0000		0.7700		9.8417		(81)	
Northwest	3.8000	12.9236		0.4300		0.0000		0.7700		16.2602		(81)	
Solar gains	94.0471	152.1767	226.7937	325.9636	387.7474	426.8769	400.9774	351.1527	279.0853	185.7266	117.0645	78.6711	(83)
Total gains	601.8690	656.3028	713.3268	785.2898	819.4081	833.5850	792.9755	750.2916	693.7662	627.8026	589.5963	574.0621	(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	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	58.1774	
alpha	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	4.8785	
util living area	0.9814	0.9705	0.9382	0.8495	0.6763	0.4408	0.2899	0.3161	0.5965	0.8709	0.9629	0.9846	(86)
Tweekday	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	
Tweekend	20.4284	20.5092	20.6699	20.8476	20.9611	20.9961	20.9996	20.9994	20.9835	20.8533	20.6147	20.4038	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.1179	20.2408	20.4905	20.7620	20.9400	20.9940	20.9994	20.9991	20.9743	20.7735	20.3984	20.0799	(87)
Th 2	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	19.9161	(88)
util rest of house	0.9755	0.9614	0.9191	0.8068	0.6014	0.3477	0.1888	0.2094	0.4959	0.8232	0.9494	0.9796	(89)
Tweekday	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	
Tweekend	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	
MIT 2	18.7899	18.9676	19.3148	19.6737	19.8700	19.9137	19.9160	19.9160	19.9023	19.6946	19.2024	18.7356	(90)
Living area fraction													
MIT	19.3225	19.4782	19.7863	20.1102	20.2992	20.3470	20.3506	20.3504	20.3322	20.1273	19.6821	19.2748	(91)
Temperature adjustment												0.0000	
adjusted MIT	19.3225	19.4782	19.7863	20.1102	20.2992	20.3470	20.3506	20.3504	20.3322	20.1273	19.6821	19.2748	(93)

8. Space heating requirement

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Utilisation	0.9713	0.9568	0.9164	0.8152	0.6290	0.3851	0.2294	0.2523	0.5358	0.8336	0.9458	0.9757 (94)
Useful gains	584.6037	627.9761	653.6756	640.1561	515.4163	320.9961	181.9471	189.2997	371.7369	523.3475	557.6300	560.1359 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1056.6072	1031.0297	920.1945	758.5256	542.2643	322.9408	182.0541	189.4717	381.2794	633.5046	867.8743	1053.0588 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	351.1705	270.8520	198.2900	85.2261	19.9749	0.0000	0.0000	0.0000	0.0000	81.9568	223.3759	366.7347 (98)
Space heating												1597.5809 (98)
Space heating per m2												25.9095 (99)

(98) / (4) =

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 %)												219.2255 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												728.7386 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	351.1705	270.8520	198.2900	85.2261	19.9749	0.0000	0.0000	0.0000	0.0000	81.9568	223.3759	366.7347 (98)
Space heating efficiency (main heating system 1)	219.2255	219.2255	219.2255	219.2255	219.2255	0.0000	0.0000	0.0000	0.0000	219.2255	219.2255	219.2255 (210)
Space heating fuel (main heating system)	160.1869	123.5495	90.4503	38.8760	9.1116	0.0000	0.0000	0.0000	0.0000	37.3847	101.8932	167.2865 (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	141.6438	125.0792	132.8407	122.3690	121.8901	111.4432	110.2609	117.9702	116.7852	128.0327	131.5993	138.8203 (64)
Efficiency of water heater												170.2800 (216)
(217)m	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (217)
Fuel for water heating, kWh/month	83.1829	73.4550	78.0131	71.8634	71.5821	65.4470	64.7527	69.2801	68.5842	75.1895	77.2840	81.5247 (219)
Water heating fuel used												880.1589 (219)
Annual totals kWh/year												
Space heating fuel - main system												728.7386 (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)												39.2638 (230a)
Total electricity for the above, kWh/year												39.2638 (231)
Electricity for lighting (calculated in Appendix L)												286.5989 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 1.20 * 1090 * 1.00) =										-1046.8728		-1046.8728 (233)
Total delivered energy for all uses												887.8875 (238)

10a. Fuel costs - using BEDF prices (440)

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	728.7386	16.9600	123.5941 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	880.1589	16.9600	149.2750 (247)
Mechanical ventilation fans	39.2638	16.9600	6.6591 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	286.5989	16.9600	48.6072 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-1046.8728	16.9600	-177.5496 (252)
Total energy cost			150.5857 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	728.7386	0.5190	378.2153 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	880.1589	0.5190	456.8025 (264)
Space and water heating			835.0178 (265)
Pumps and fans	39.2638	0.5190	20.3779 (267)
Energy for lighting	286.5989	0.5190	148.7448 (268)
Energy saving/generation technologies			
PV Unit	-1046.8728	0.5190	-543.3270 (269)
Total kg/year			460.8136 (272)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	728.7386	3.0700	2237.2276 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	880.1589	3.0700	2702.0879 (264)
Space and water heating			4939.3154 (265)
Pumps and fans	39.2638	3.0700	120.5398 (267)
Energy for lighting	286.5989	3.0700	879.8586 (268)
Energy saving/generation technologies			
PV Unit	-1046.8728	3.0700	-3213.8994 (269)
Primary energy kWh/year			2725.8145 (272)
Primary energy kWh/m2/year			44.2072 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 92
Current environmental impact rating: A 93

(For testing purposes):

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

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

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

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 440 TEST (26 Feb 2019)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£328	£328	£0
Space heating	£130	£130	£0
Water heating	£149	£149	£0
Lighting	£49	£49	£0
Generated (PV)	-£178	-£178	£0
Total cost of fuels	£150	£150	£0
Total cost of uses	£150	£150	£0
Delivered energy	14 kWh/m²	14 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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 Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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 Designed) 9.92

Overheating Calculation Input Data

Dwelling type	Detached Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	252.3 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	282.02 (P1)
Transmission heat loss coefficient	50.79 (37)
Summer heat loss coefficient	332.81 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
South East	0.000	1.000	None
South West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
South East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South East	1.6800	119.9223	0.4600	0.0000	0.9000	83.4084
South West	3.0600	119.9223	0.4600	0.0000	0.9000	151.9224
North West	2.1500	98.8453	0.4600	0.0000	0.9000	87.9822
North West	3.8000	98.8453	0.4300	0.0000	0.9000	145.3619
total:						468.6748

Solar gains	Jun	Jul	Aug	
	499	469	410	(P3/P4)
Internal gains	407	392	399	
Total summer gains	906	861	810	(P5)
Summer gain/loss ratio	2.72	2.59	2.43	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 252.3)	0.23	0.23	0.23	
Threshold temperature	18.95	20.72	20.47	(P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant	
Assessment of likelihood of high internal temperature:	Slight			