

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2F Apartment (ASHP+PV)				Issued on Date	15/12/2022
Assessment Reference	090	Prop Type Ref	2F Apartment-Det-As			
Property	Plot 090, 1 Bed, K, B					
SAP Rating	93 A	DER	10.70	TER	31.39	
Environmental	94 A	% DER<TER	65.91			
CO ₂ Emissions (t/year)	0.36	DFEE	44.88	TFEE	56.52	
General Requirements Compliance	Pass	% DFEE<TFEE	20.59			
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

Top-floor flat, total floor area 51 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) 31.39 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.70 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	OK
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

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

Based on:

Overshading: Average
Windows facing North East: 1.07 m², No overhang
Windows facing South West: 1.84 m², No overhang
Windows facing North West: 6.71 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.09 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.90 W/m²K
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	50.7500 (1b)	x 2.3600 (2b)	= 119.7700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.7700 (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)			5.8200	1.1450	6.6641		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
100mm Knauf Supafil 34	50.9500	9.6200	41.3300	0.2500	10.3325	52.8000	2182.2240 (29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)
500mm Loft roll	50.7500		50.7500	0.0900	4.5675	9.0000	456.7500 (30)
Total net area of external elements Aum(A, m ²)			118.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.3270		(32)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
Timber partition			100.4000			9.0000	903.6000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7900.2740 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							155.6704 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.7387 (36)
Total fabric heat loss					(33) + (36) =		36.0657 (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	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621 (38)
Heat transfer coeff	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277 (39)
Average = Sum(39)m / 12 =												55.8277 (39)
HLP	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001 (40)
HLP (average)												1.1001 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)

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Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (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	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
171.5013 151.4092 159.5960 143.8758 141.5791 127.3476 123.1042 133.9800 133.3977 149.1513 156.6957 167.6478 (62)												
WWHRS	-36.6891	-32.2740	-32.9440	-27.1578	-25.2437	-20.8440	-17.6757	-21.3895	-21.9978	-27.1561	-31.4052	-35.4500 eq. (G10)
Total of WWHRS savings												-330.2268
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	134.8122	119.1353	126.6520	116.7180	116.3354	106.5036	105.4285	112.5906	111.3999	121.9951	125.2904	132.1978 (64)
Total per year (kWh/year) = Sum(64)m =												1429.0588 (64)
Heat gains from water heating, kWh/month	80.1078	71.1933	76.1493	70.1777	70.1587	64.6821	64.0158	67.6320	66.6937	72.6765	74.4403	78.8266 (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	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4801	11.9729	9.7370	7.3716	5.5103	4.6520	5.0267	6.5339	8.7698	11.1352	12.9965	13.8548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.1817	150.7297	146.8287	138.5239	128.0406	118.1878	111.6055	110.0575	113.9585	122.2633	132.7466	142.5994	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	(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)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	(71)
Water heating gains (Table 5)	107.6718	105.9424	102.3512	97.4690	94.2994	89.8363	86.0427	90.9033	92.6302	97.6834	103.3893	105.9497	(72)
Total internal gains	319.0166	317.3281	307.6000	292.0475	276.5333	261.3591	251.3579	256.1776	264.0415	279.7649	297.8154	311.0868	(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
Northeast	1.0700	11.2829	0.4600	0.0000	0.7700	4.2762 (75)
Southwest	1.8400	36.7938	0.4600	0.0000	0.7700	23.9796 (79)
Northwest	2.9100	11.2829	0.4600	0.0000	0.7700	11.6296 (81)
Northwest	3.8000	11.2829	0.4300	0.0000	0.7700	14.1960 (81)

Solar gains	54.0813	102.1190	166.2817	250.5463	321.2642	336.8134	317.2864	261.7953	195.0314	120.0240	66.5977	45.1041 (83)
Total gains	373.0979	419.4479	473.8816	542.5938	597.7975	598.1725	568.6444	517.9729	459.0729	399.7889	364.4131	356.1909 (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	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088
alpha	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206
util living area	0.9779	0.9652	0.9349	0.8602	0.7253	0.5563	0.4200	0.4753	0.7103	0.9018	0.9646	0.9812 (86)
Tuesday	17.9919	18.2745	18.7604	19.3430	19.7664	19.9496	19.9914	19.9850	19.8612	19.3170	18.5459	17.9110
Tuesday	20.0198	20.1468	20.3670	20.6394	20.8521	20.9576	20.9882	20.9816	20.8979	20.6199	20.2668	19.9836
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	19.4873	19.6802	20.0230	20.4369	20.7718	20.9349	20.9818	20.9717	20.8405	20.4134	19.8551	19.4314 (87)
Th 2	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008 (88)
util rest of house	0.9734	0.9582	0.9216	0.8324	0.6750	0.4822	0.3297	0.3803	0.6399	0.8757	0.9562	0.9773 (89)
Tuesday	17.9919	18.2745	18.7604	19.3430	19.7664	19.9496	19.9914	19.9850	19.8612	19.3170	18.5459	17.9110
Tuesday	17.9919	18.2745	18.7604	19.3430	19.7664	19.9496	19.9914	19.9850	19.8612	19.3170	18.5459	17.9110
MIT 2	17.9919	18.2745	18.7604	19.3430	19.7664	19.9496	19.9914	19.9850	19.8612	19.3170	18.5459	17.9110 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	18.6177	18.8628	19.2888	19.8008	20.1871	20.3620	20.4059	20.3979	20.2710	19.7759	19.0938	18.5473 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6177	18.8628	19.2888	19.8008	20.1871	20.3620	20.4059	20.3979	20.2710	19.7759	19.0938	18.5473 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9652	0.9480	0.9103	0.8261	0.6850	0.5099	0.3670	0.4190	0.6603	0.8688	0.9464	0.9698 (94)

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Useful gains	360.1044	397.6555	431.3525	448.2476	409.4780	304.9939	208.6663	217.0418	303.1228	347.3266	344.8849	345.4167 (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												
Month fracti	799.3259	779.5129	713.9710	608.5693	473.8181	321.6790	212.4755	223.1946	344.5155	512.2679	669.5889	800.9789 (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	326.7808	256.6082	210.2682	115.4316	47.8691	0.0000	0.0000	0.0000	0.0000	122.7164	233.7869	338.9383 (98)
Space heating per m2											(98) / (4) =	32.5596 (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 %)												178.8797 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												923.7488 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	326.7808	256.6082	210.2682	115.4316	47.8691	0.0000	0.0000	0.0000	0.0000	122.7164	233.7869	338.9383 (98)
Space heating efficiency (main heating system 1)	178.8797	178.8797	178.8797	178.8797	178.8797	0.0000	0.0000	0.0000	0.0000	178.8797	178.8797	178.8797 (210)
Space heating fuel (main heating system)	182.6819	143.4529	117.5472	64.5303	26.7605	0.0000	0.0000	0.0000	0.0000	68.6027	130.6950	189.4783 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	134.8122	119.1353	126.6520	116.7180	116.3354	106.5036	105.4285	112.5906	111.3999	121.9951	125.2904	132.1978 (64)
Efficiency of water heater	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (216)
Fuel for water heating, kWh/month	79.1709	69.9643	74.3787	68.5447	68.3201	62.5462	61.9148	66.1208	65.4216	71.6438	73.5791	77.6356 (219)
Water heating fuel used												839.2406 (219)
Annual totals kWh/year												
Space heating fuel - main system												923.7488 (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)												33.0160 (230a)
Total electricity for the above, kWh/year												33.0160 (231)
Electricity for lighting (calculated in Appendix L)												238.0628 (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												1046.0489 (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	923.7488	0.5190	479.4256 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	839.2406	0.5190	435.5659 (264)
Space and water heating			914.9915 (265)
Pumps and fans	33.0160	0.5190	17.1353 (267)
Energy for lighting	238.0628	0.5190	123.5546 (268)
Energy saving/generation technologies			
PV Unit	-988.0192	0.5190	-512.7820 (269)
Total CO2, kg/year			542.8994 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.7000 (273)

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

DER			10.7000 ZC1
Total Floor Area		TFA	50.7500
Assumed number of occupants		N	1.7122
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4191 ZC2
CO2 emissions from cooking, equation (L16)			3.1545 ZC3
Total CO2 emissions			31.2736 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			31.2736 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7500 (1b)	x 2.3600 (2b)	= 119.7700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.7700 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1670 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4170 (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) =	0.3857 (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	0.4918	0.4821	0.4725	0.4243	0.4146	0.3664	0.3664	0.3568	0.3857	0.4146	0.4339	0.4532 (22b)
	0.6209	0.6162	0.6116	0.5900	0.5860	0.5671	0.5671	0.5636	0.5744	0.5860	0.5941	0.6027 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Opening Type (Uw = 1.40)			9.6200	1.3258	12.7538		(27)
100mm Knauf Supafil 34	50.9500	9.6200	41.3300	0.1800	7.4394		(29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450		(29a)
500mm Loft roll	50.7500		50.7500	0.1300	6.5975		(30)
Total net area of external elements Aum(A, m ²)			118.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5157		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1198 (36)
Total fabric heat loss						(33) + (36) =	37.6355 (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	24.5415	24.3559	24.1740	23.3196	23.1597	22.4155	22.4155	22.2777	22.7021	23.1597	23.4831	23.8212 (38)
Heat transfer coeff	62.1770	61.9914	61.8095	60.9550	60.7952	60.0510	60.0510	59.9131	60.3376	60.7952	61.1186	61.4567 (39)
Average = Sum(39)m / 12 =												60.9543 (39)
HLP	1.2252	1.2215	1.2179	1.2011	1.1979	1.1833	1.1833	1.1806	1.1889	1.1979	1.2043	1.2110 (40)
HLP (average)												1.2011 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (46)
Water storage loss:												200.0000 (47)
Store volume												1.6525 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8924 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	173.0505	152.8086	161.1453	145.3751	143.1284	128.8469	124.6535	135.5293	134.8970	150.7006	158.1950	169.1971 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	173.0505	152.8086	161.1453	145.3751	143.1284	128.8469	124.6535	135.5293	134.8970	150.7006	158.1950	169.1971 (64)
Heat gains from water heating, kWh/month	81.3472	72.3128	77.3887	71.3772	71.3981	65.8815	65.2552	68.8714	67.8932	73.9159	75.6398	80.0660 (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	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4801	11.9729	9.7370	7.3716	5.5103	4.6520	5.0267	6.5339	8.7698	11.1352	12.9965	13.8548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.1817	150.7297	146.8287	138.5239	128.0406	118.1878	111.6055	110.0575	113.9585	122.2633	132.7466	142.5994	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	(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)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	(71)
Water heating gains (Table 5)	109.3377	107.6083	104.0171	99.1349	95.9652	91.5021	87.7086	92.5691	94.2961	99.3493	105.0552	107.6155	(72)
Total internal gains	323.6825	321.9939	312.2658	296.7134	281.1992	266.0250	256.0238	260.8435	268.7073	284.4308	302.4813	315.7527	(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	
Northeast					1.0700	11.2829	0.6300	0.7000	0.7700		3.6896 (75)	
Southwest					1.8400	36.7938	0.6300	0.7000	0.7700		20.6902 (79)	
Northwest					6.7100	11.2829	0.6300	0.7000	0.7700		23.1375 (81)	
Solar gains	47.5173	89.8504	146.6062	221.3248	284.1136	297.9872	280.6629	231.3845	172.0970	105.6856	58.5375	39.6149 (83)
Total gains	371.1998	411.8443	458.8720	518.0382	565.3128	564.0122	536.6867	492.2280	440.8043	390.1164	361.0188	355.3675 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.6818	56.8515	57.0188	57.8181	57.9702	58.6886	58.6886	58.8236	58.4098	57.9702	57.6634	57.3462	
alpha	4.7788	4.7901	4.8013	4.8545	4.8647	4.9126	4.9126	4.9216	4.8940	4.8647	4.8442	4.8231	
util living area	0.9953	0.9915	0.9800	0.9387	0.8295	0.6446	0.4845	0.5452	0.8058	0.9612	0.9908	0.9962	(86)
MIT	19.7789	19.9227	20.1837	20.5393	20.8231	20.9618	20.9923	20.9867	20.8877	20.5280	20.0987	19.7582	(87)
Th 2	19.8999	19.9028	19.9057	19.9191	19.9217	19.9334	19.9334	19.9356	19.9289	19.9217	19.9166	19.9112	(88)
util rest of house	0.9937	0.9886	0.9730	0.9170	0.7747	0.5521	0.3711	0.4265	0.7253	0.9429	0.9872	0.9949	(89)
MIT 2	18.2927	18.5038	18.8826	19.3911	19.7554	19.9094	19.9307	19.9304	19.8428	19.3873	18.7707	18.2707	(90)
Living area fraction	18.9147	19.0977	19.4272	19.8717	20.2023	20.3499	20.3750	20.3725	20.2801	19.8647	19.3265	18.8932	(92)
Temperature adjustment	18.9147	19.0977	19.4272	19.8717	20.2023	20.3499	20.3750	20.3725	20.2801	19.8647	19.3265	18.8932	(93)
adjusted MIT	18.9147	19.0977	19.4272	19.8717	20.2023	20.3499	20.3750	20.3725	20.2801	19.8647	19.3265	18.8932	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9918	0.9858	0.9691	0.9159	0.7903	0.5896	0.4188	0.4764	0.7543	0.9418	0.9845	0.9932	(94)
Ext temp.	368.1379	406.0068	444.6784	474.4786	446.7922	332.5680	224.7836	234.5187	332.4878	367.3925	355.4388	352.9577	(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	908.6983	880.1333	799.0217	668.7784	516.8965	345.2861	226.6937	238.0054	372.8908	563.2500	747.2685	902.9982	(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	402.1769	318.6130	263.6315	139.8959	52.1576	0.0000	0.0000	0.0000	0.0000	145.7180	282.1174	409.2301	(98)
												2013.5404	(98)
												39.6757	(99)

8c. Space cooling requirement

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													2153.5191 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	402.1769	318.6130	263.6315	139.8959	52.1576	0.0000	0.0000	0.0000	0.0000	145.7180	282.1174	409.2301	(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)	430.1358	340.7626	281.9588	149.6213	55.7835	0.0000	0.0000	0.0000	0.0000	155.8481	301.7298	437.6793	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	173.0505	152.8086	161.1453	145.3751	143.1284	128.8469	124.6535	135.5293	134.8970	150.7006	158.1950	169.1971	(64)
Efficiency of water heater (217)m	86.9910	86.7304	86.1194	84.7116	82.4021	79.8000	79.8000	79.8000	79.8000	84.7244	86.3406	87.0844	(216)
Fuel for water heating, kWh/month	198.9293	176.1879	187.1185	171.6117	173.6952	161.4623	156.2073	169.8362	169.0438	177.8715	183.2219	194.2909	(219)
Water heating fuel used												2119.4767	(219)
Annual totals kWh/year													
Space heating fuel - main system												2153.5191	(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)												238.0628	(232)
Total delivered energy for all uses												4586.0586	(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	2153.5191	0.2160	465.1601 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2119.4767	0.2160	457.8070 (264)
Space and water heating			922.9671 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	238.0628	0.5190	123.5546 (268)
Total CO2, kg/m2/year			1085.4467 (272)
Emissions per m2 for space and water heating			18.1865 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4346 (272b)
Emissions per m2 for pumps and fans			0.7670 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.1865 * 1.55) + 2.4346 + 0.7670, rounded to 2 d.p.			31.3900 (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	50.7500 (1b)	x 2.3600 (2b)	= 119.7700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.7700 (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) = 0.1670 (8)
Pressure test					Yes
Measured/design AP50					4.0100
Infiltration rate					0.3675 (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) =				0.3399 (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	0.4334	0.4249	0.4164	0.3739	0.3654	0.3229	0.3229	0.3144	0.3399	0.3654	0.3824	0.3994 (22b)
Effective ac	0.5939	0.5903	0.5867	0.5699	0.5668	0.5521	0.5521	0.5494	0.5578	0.5668	0.5731	0.5798 (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)			5.8200	1.1450	6.6641		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
100mm Knauf Supafil 34	50.9500	9.6200	41.3300	0.2500	10.3325	52.8000	2182.2240 (29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)
500mm Loft roll	50.7500		50.7500	0.0900	4.5675	9.0000	456.7500 (30)
Total net area of external elements Aum(A, m ²)			118.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.3270		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
Timber partition			100.4000			9.0000	903.6000 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7900.2740 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							155.6704 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.7387 (36)
Total fabric heat loss						(33) + (36) =	36.0657 (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	23.4741	23.3300	23.1887	22.5251	22.4009	21.8229	21.8229	21.7159	22.0455	22.4009	22.6521	22.9147 (38)
Heat transfer coeff	59.5398	59.3957	59.2544	58.5907	58.4666	57.8886	57.8886	57.7815	58.1112	58.4666	58.7178	58.9804 (39)
Average = Sum(39)m / 12 =												58.5901 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1732	1.1704	1.1676	1.1545	1.1521	1.1407	1.1407	1.1386	1.1450	1.1521	1.1570	1.1622 (40)
HLP (average)												1.1545 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)										Total = Sum(45)m =		1177.9137 (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:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	25.9514	22.6973	23.4216	20.4195	19.5930	16.9073	15.6671	17.9782	18.1929	21.2021	23.1437	25.1326 (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	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4801	11.9729	9.7370	7.3716	5.5103	4.6520	5.0267	6.5339	8.7698	11.1352	12.9965	13.8548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.1817	150.7297	146.8287	138.5239	128.0406	118.1878	111.6055	110.0575	113.9585	122.2633	132.7466	142.5994	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	(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)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	(71)
Water heating gains (Table 5)	34.8810	33.7757	31.4806	28.3604	26.3347	23.4823	21.0579	24.1642	25.2679	28.4974	32.1441	33.7804	(72)
Total internal gains	246.2257	245.1614	236.7293	222.9389	208.5686	195.0052	186.3731	189.4386	196.6792	210.5789	226.5701	238.9175	(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			
Northeast				1.0700	11.2829	0.4600	0.0000	0.7700	4.2762 (75)			
Southwest				1.8400	36.7938	0.4600	0.0000	0.7700	23.9796 (79)			
Northwest				2.9100	11.2829	0.4600	0.0000	0.7700	11.6296 (81)			
Northwest				3.8000	11.2829	0.4300	0.0000	0.7700	14.1960 (81)			
Solar gains	54.0813	102.1190	166.2817	250.5463	321.2642	336.8134	317.2864	261.7953	195.0314	120.0240	66.5977	45.1041 (83)
Total gains	300.3070	347.2803	403.0110	473.4852	529.8328	531.8186	503.6595	451.2339	391.7106	330.6029	293.1678	284.0216 (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	36.8580	36.9475	37.0356	37.4551	37.5346	37.9094	37.9094	37.9796	37.7642	37.5346	37.3741	37.2077	
alpha	3.4572	3.4632	3.4690	3.4970	3.5023	3.5273	3.5273	3.5320	3.5176	3.5023	3.4916	3.4805	
util living area	0.9888	0.9807	0.9602	0.9033	0.7879	0.6233	0.4821	0.5480	0.7876	0.9423	0.9819	0.9907	(86)
MIT	19.1719	19.3848	19.7604	20.2592	20.6671	20.8969	20.9685	20.9510	20.7559	20.2184	19.6092	19.1349	(87)
Th 2	19.9415	19.9438	19.9460	19.9566	19.9586	19.9678	19.9678	19.9695	19.9642	19.9586	19.9546	19.9504	(88)
util rest of house	0.9864	0.9765	0.9512	0.8810	0.7405	0.5443	0.3786	0.4410	0.7216	0.9244	0.9772	0.9887	(89)
MIT 2	18.2767	18.4894	18.8608	19.3490	19.7200	19.9115	19.9565	19.9503	19.8107	19.3219	18.7217	18.2465	(90)
Living area fraction									fLA = Living area / (4) =			0.4185	(91)
MIT	18.6514	18.8641	19.2373	19.7299	20.1163	20.3239	20.3801	20.3691	20.2063	19.6971	19.0932	18.6183	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6514	18.8641	19.2373	19.7299	20.1163	20.3239	20.3801	20.3691	20.2063	19.6971	19.0932	18.6183	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9824	0.9709	0.9437	0.8754	0.7483	0.5729	0.4212	0.4842	0.7387	0.9189	0.9721	0.9852	(94)
Ext temp.	295.0153	337.1715	380.3323	414.5073	396.4731	304.6789	212.1293	218.5059	289.3504	303.7891	284.9831	279.8300	(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	854.4778	829.4090	754.7401	634.5329	492.0750	331.3500	218.8218	229.3402	354.8448	531.8753	704.2124	850.3956	(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	416.2401	330.7836	278.5594	158.4184	71.1278	0.0000	0.0000	0.0000	0.0000	169.6961	301.8451	424.5008	(98)
Space heating per m2												2151.1714	(98)
												42.3876	(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	544.1525	428.3753	439.1396	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8596	0.9085	0.8788	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	467.7454	389.1636	385.9042	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	686.4196	652.2837	591.9877	0.0000	0.0000	0.0000	0.0000	(103)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Month fraction	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	157.4454	195.7613	153.3262	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												506.5329 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.3614	48.9403	38.3315	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												126.6332 (107)
Space cooling per m2												2.4952 (108)
Energy for space heating												42.3876 (99)
Energy for space cooling												2.4952 (108)
Total												44.8828 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.9 (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	50.7500 (1b)	x 2.3600 (2b)	= 119.7700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.7700 (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) = 0.1670 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4170 (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) =	0.3857 (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	0.4918	0.4821	0.4725	0.4243	0.4146	0.3664	0.3664	0.3568	0.3857	0.4146	0.4339	0.4532 (22b)
	0.6209	0.6162	0.6116	0.5900	0.5860	0.5671	0.5671	0.5636	0.5744	0.5860	0.5941	0.6027 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Opening Type (Uw = 1.40)			9.6200	1.3258	12.7538		(27)
100mm Knauf Supafil 34	50.9500	9.6200	41.3300	0.1800	7.4394		(29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450		(29a)
500mm Loft roll	50.7500		50.7500	0.1300	6.5975		(30)
Total net area of external elements Aum(A, m ²)			118.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5157		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1198 (36)
Total fabric heat loss						(33) + (36) =	37.6355 (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	24.5415	24.3559	24.1740	23.3196	23.1597	22.4155	22.4155	22.2777	22.7021	23.1597	23.4831	23.8212 (38)
Heat transfer coeff	62.1770	61.9914	61.8095	60.9550	60.7952	60.0510	60.0510	59.9131	60.3376	60.7952	61.1186	61.4567 (39)
Average = Sum(39)m / 12 =												60.9543 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2252	1.2215	1.2179	1.2011	1.1979	1.1833	1.1833	1.1806	1.1889	1.1979	1.2043	1.2110 (40)
HLP (average)												1.2011 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	25.9514	22.6973	23.4216	20.4195	19.5930	16.9073	15.6671	17.9782	18.1929	21.2021	23.1437	25.1326 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4801	11.9729	9.7370	7.3716	5.5103	4.6520	5.0267	6.5339	8.7698	11.1352	12.9965	13.8548 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.1817	150.7297	146.8287	138.5239	128.0406	118.1878	111.6055	110.0575	113.9585	122.2633	132.7466	142.5994 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610 (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)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880 (71)
Water heating gains (Table 5)	34.8810	33.7757	31.4806	28.3604	26.3347	23.4823	21.0579	24.1642	25.2679	28.4974	32.1441	33.7804 (72)
Total internal gains	246.2257	245.1614	236.7293	222.9389	208.5686	195.0052	186.3731	189.4386	196.6792	210.5789	226.5701	238.9175 (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
Northeast	1.0700	11.2829	0.6300	0.7000	0.7700	3.6896 (75)
Southwest	1.8400	36.7938	0.6300	0.7000	0.7700	20.6902 (79)
Northwest	6.7100	11.2829	0.6300	0.7000	0.7700	23.1375 (81)

Solar gains	47.5173	89.8504	146.6062	221.3248	284.1136	297.9872	280.6629	231.3845	172.0970	105.6856	58.5375	39.6149 (83)
Total gains	293.7430	335.0118	383.3355	444.2637	492.6822	492.9924	467.0360	420.8231	368.7762	316.2645	285.1076	278.5324 (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	56.6818	56.8515	57.0188	57.8181	57.9702	58.6886	58.6886	58.8236	58.4098	57.9702	57.6634	57.3462
alpha	4.7788	4.7901	4.8013	4.8545	4.8647	4.9126	4.9126	4.9216	4.8940	4.8647	4.8442	4.8231
util living area	0.9983	0.9964	0.9902	0.9642	0.8812	0.7140	0.5502	0.6243	0.8765	0.9825	0.9966	0.9987 (86)
MIT	19.6397	19.7866	20.0556	20.4331	20.7592	20.9405	20.9867	20.9763	20.8289	20.4101	19.9639	19.6194 (87)
Th 2	19.8999	19.9028	19.9057	19.9191	19.9217	19.9334	19.9334	19.9356	19.9289	19.9217	19.9166	19.9112 (88)
util rest of house	0.9977	0.9952	0.9866	0.9500	0.8354	0.6200	0.4248	0.4947	0.8101	0.9732	0.9952	0.9982 (89)
MIT 2	18.6642	18.8129	19.0824	19.4615	19.7598	19.9065	19.9301	19.9289	19.8315	19.4467	19.0011	18.6529 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	19.0725	19.2204	19.4897	19.8681	20.1780	20.3393	20.3723	20.3672	20.2490	19.8499	19.4041	19.0574 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0725	19.2204	19.4897	19.8681	20.1780	20.3393	20.3723	20.3672	20.2490	19.8499	19.4041	19.0574 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9971	0.9941	0.9848	0.9492	0.8476	0.6579	0.4778	0.5495	0.8328	0.9724	0.9943	0.9977 (94)
Ext temp.	292.8818	333.0460	377.4991	421.7082	417.6196	324.3328	223.1476	231.2521	307.1305	307.5490	283.4893	277.9009 (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	918.5091	887.7420	802.8858	668.5626	515.4244	344.6476	226.5308	237.6891	371.0140	562.3491	752.0076	913.0880 (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	465.4667	372.7557	316.4877	177.7352	72.7668	0.0000	0.0000	0.0000	0.0000	189.5713	337.3331	472.5792 (98)
												2404.6958 (98)
												47.3832 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8790	0.9321	0.9026	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	496.1975	414.2218	410.9679	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	641.0383	609.4770	556.4427	0.0000	0.0000	0.0000	0.0000 (102)
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	104.2853	145.2699	108.2332	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												357.7884 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	26.0713	36.3175	27.0583	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											89.4471 (107)
Space cooling per m2											1.7625 (108)
Energy for space heating											47.3832 (99)
Energy for space cooling											1.7625 (108)
Total											49.1457 (109)
Target Fabric Energy Efficiency (TFEE)											56.5 (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	50.7500 (1b)	x 2.3600 (2b)	= 119.7700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.7700 (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	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)			5.8200	1.1450	6.6641		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
100mm Knauf Supafil 34	50.9500	9.6200	41.3300	0.2500	10.3325	52.8000	2182.2240 (29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)
500mm Loft roll	50.7500		50.7500	0.0900	4.5675	9.0000	456.7500 (30)
Total net area of external elements Aum(A, m ²)			118.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3270		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
Timber partition			100.4000			9.0000	903.6000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7900.2740 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							155.6704 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.7387 (36)
Total fabric heat loss					(33) + (36) =		36.0657 (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	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621 (38)
Heat transfer coeff	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277 (39)
Average = Sum(39)m / 12 =												55.8277 (39)
HLP	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001 (40)
HLP (average)												1.1001 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (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												
171.5013 151.4092 159.5960 143.8758 141.5791 127.3476 123.1042 133.9800 133.3977 149.1513 156.6957 167.6478 (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	171.5013	151.4092	159.5960	143.8758	141.5791	127.3476	123.1042	133.9800	133.3977	149.1513	156.6957	167.6478 (64)
RHI water heating demand												1759 (64)
Heat gains from water heating, kWh/month	80.1078	71.1933	76.1493	70.1777	70.1587	64.6821	64.0158	67.6320	66.6937	72.6765	74.4403	78.8266 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.7003	29.9323	24.3426	18.4289	13.7758	11.6301	12.5667	16.3347	21.9244	27.8381	32.4912	34.6369 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.6592	224.9697	219.1473	206.7521	191.1054	176.3997	166.5754	164.2649	170.0873	182.4825	198.1292	212.8349 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854 (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)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880 (71)
Water heating gains (Table 5)	107.6718	105.9424	102.3512	97.4690	94.2994	89.8363	86.0427	90.9033	92.6302	97.6834	103.3893	105.9497 (72)
Total internal gains	445.2607	442.0738	427.0705	403.8794	380.4099	359.0954	346.4142	352.7322	365.8713	389.2334	415.2391	434.6508 (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	
Northeast					1.0700	12.9236	0.4600	0.0000	0.7700		4.8980 (75)	
Southwest					1.8400	40.4699	0.4600	0.0000	0.7700		26.3754 (79)	
Northwest					2.9100	12.9236	0.4600	0.0000	0.7700		13.3206 (81)	
Northwest					3.8000	12.9236	0.4300	0.0000	0.7700		16.2602 (81)	
Solar gains	60.8541	103.9022	168.1128	261.8807	327.1119	366.7328	341.8657	288.6572	214.1057	130.7033	76.8801	50.1939 (83)
Total gains	506.1147	545.9760	595.1833	665.7602	707.5218	725.8282	688.2799	641.3894	579.9770	519.9367	492.1193	484.8448 (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	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088
alpha	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206
util living area	0.9393	0.9196	0.8675	0.7546	0.5813	0.3770	0.2502	0.2766	0.5262	0.7872	0.9054	0.9459 (86)
Tweekday	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206
Tweekend	20.2879	20.3822	20.5804	20.7974	20.9389	20.9906	20.9985	20.9978	20.9679	20.8005	20.5161	20.2589
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	19.9009	20.0444	20.3524	20.6837	20.9057	20.9855	20.9977	20.9966	20.9499	20.6921	20.2443	19.8563 (87)
Th 2	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008 (88)
util rest of house	0.9280	0.9051	0.8438	0.7144	0.5216	0.3047	0.1702	0.1912	0.4465	0.7415	0.8856	0.9356 (89)
Tweekday	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206
Tweekend	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206
MIT 2	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	19.1348	19.3141	19.6900	20.0857	20.3299	20.4080	20.4176	20.4170	20.3774	20.1002	19.5699	19.0796 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1348	19.3141	19.6900	20.0857	20.3299	20.4080	20.4176	20.4170	20.3774	20.1002	19.5699	19.0796 (93)

8. Space heating requirement

Utilisation	0.9161	0.8933	0.8355	0.7181	0.5419	0.3345	0.2037	0.2270	0.4774	0.7465	0.8757	0.9240 (94)
Useful gains	463.6566	487.7103	497.2906	478.0578	383.3903	242.8244	140.1984	145.5682	276.9053	388.1106	430.9281	447.9922 (95)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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	783.5289	765.6249	686.1218	568.6458	409.2121	246.0861	140.5540	146.1012	289.0402	474.5474	645.9232	780.4481 (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	237.9850	186.7586	140.4904	65.2233	19.2114	0.0000	0.0000	0.0000	0.0000	64.3090	154.7965	247.3472 (98)
Space heating												1116.1213 (98)
RHI space heating demand												1116 (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	50.7500 (1b)	x 2.3600 (2b)	= 119.7700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.7700 (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)			5.8200	1.1450	6.6641		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
100mm Knauf Supafil 34	50.9500	9.6200	41.3300	0.2500	10.3325	52.8000	2182.2240 (29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)
500mm Loft roll	50.7500		50.7500	0.0900	4.5675	9.0000	456.7500 (30)
Total net area of external elements Aum(A, m ²)			118.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3270		(32)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
Timber partition			100.4000			9.0000	903.6000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7900.2740 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							155.6704 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.7387 (36)
Total fabric heat loss					(33) + (36) =		36.0657 (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	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621 (38)
Heat transfer coeff	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277 (39)
Average = Sum(39)m / 12 =												55.8277 (39)
HLP	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001 (40)
HLP (average)												1.1001 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (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	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
171.5013 151.4092 159.5960 143.8758 141.5791 127.3476 123.1042 133.9800 133.3977 149.1513 156.6957 167.6478 (62)												
WWHRS	-36.6891	-32.2740	-32.9440	-27.1578	-25.2437	-20.8440	-17.6757	-21.3895	-21.9978	-27.1561	-31.4052	-35.4500 eq. (G10)
Total of WWHRS savings												-330.2268
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	134.8122	119.1353	126.6520	116.7180	116.3354	106.5036	105.4285	112.5906	111.3999	121.9951	125.2904	132.1978 (64)
Total per year (kWh/year) = Sum (64)m =												1429.0588 (64)
Heat gains from water heating, kWh/month	80.1078	71.1933	76.1493	70.1777	70.1587	64.6821	64.0158	67.6320	66.6937	72.6765	74.4403	78.8266 (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	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.7003	29.9323	24.3426	18.4289	13.7758	11.6301	12.5667	16.3347	21.9244	27.8381	32.4912	34.6369	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.6592	224.9697	219.1473	206.7521	191.1054	176.3997	166.5754	164.2649	170.0873	182.4825	198.1292	212.8349	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	(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)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	(71)
Water heating gains (Table 5)	107.6718	105.9424	102.3512	97.4690	94.2994	89.8363	86.0427	90.9033	92.6302	97.6834	103.3893	105.9497	(72)
Total internal gains	445.2607	442.0738	427.0705	403.8794	380.4099	359.0954	346.4142	352.7322	365.8713	389.2334	415.2391	434.6508	(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
Northeast	1.0700	11.2829	0.4600	0.0000	0.7700	4.2762 (75)
Southwest	1.8400	36.7938	0.4600	0.0000	0.7700	23.9796 (79)
Northwest	2.9100	11.2829	0.4600	0.0000	0.7700	11.6296 (81)
Northwest	3.8000	11.2829	0.4300	0.0000	0.7700	14.1960 (81)

Solar gains	54.0813	102.1190	166.2817	250.5463	321.2642	336.8134	317.2864	261.7953	195.0314	120.0240	66.5977	45.1041 (83)
Total gains	499.3419	544.1928	593.3522	654.4258	701.6742	695.9089	663.7007	614.5276	560.9027	509.2574	481.8369	479.7549 (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	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088
alpha	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206
util living area	0.9487	0.9289	0.8862	0.7958	0.6539	0.4900	0.3637	0.4074	0.6198	0.8318	0.9241	0.9548 (86)
Tweekday	18.4063	18.6529	19.0626	19.5264	19.8400	19.9677	19.9951	19.9915	19.9161	19.5318	18.8954	18.3258
Tweekend	20.2079	20.3206	20.5100	20.7328	20.8957	20.9718	20.9926	20.9888	20.9351	20.7288	20.4287	20.1712
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	19.7775	19.9490	20.2438	20.5828	20.8390	20.9567	20.9886	20.9828	20.8987	20.5814	20.1080	19.7209 (87)
Th 2	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008 (88)
util rest of house	0.9394	0.9163	0.8662	0.7617	0.6019	0.4211	0.2839	0.3232	0.5487	0.7952	0.9085	0.9465 (89)
Tweekday	18.4063	18.6529	19.0626	19.5264	19.8400	19.9677	19.9951	19.9915	19.9161	19.5318	18.8954	18.3258
Tweekend	18.4063	18.6529	19.0626	19.5264	19.8400	19.9677	19.9951	19.9915	19.9161	19.5318	18.8954	18.3258
MIT 2	18.4063	18.6529	19.0626	19.5264	19.8400	19.9677	19.9951	19.9915	19.9161	19.5318	18.8954	18.3258 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.9802	19.1954	19.5570	19.9685	20.2581	20.3817	20.4109	20.4064	20.3273	19.9711	19.4029	18.9097 (91)
Temperature adjustment												0.0000
adjusted MIT	18.9802	19.1954	19.5570	19.9685	20.2581	20.3817	20.4109	20.4064	20.3273	19.9711	19.4029	18.9097 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9277	0.9041	0.8561	0.7606	0.6159	0.4480	0.3170	0.3579	0.5730	0.7940	0.8973	0.9352 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Useful gains	463.2364	492.0216	507.9760	497.7267	432.1328	311.7392	210.3901	219.9678	321.3861	404.3539	432.3762	448.6684 (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												
Month fracti	819.5599	798.0792	728.9404	617.9296	477.7801	322.7765	212.7527	223.6656	347.6566	523.1651	686.8410	821.2079 (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	265.1047	205.6707	164.3975	86.5461	33.9616	0.0000	0.0000	0.0000	0.0000	88.3956	183.2146	277.1694 (98)
Space heating per m2												1304.4601 (98)
											(98) / (4) =	25.7036 (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 %)												178.8797 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												729.2387 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	265.1047	205.6707	164.3975	86.5461	33.9616	0.0000	0.0000	0.0000	0.0000	88.3956	183.2146	277.1694 (98)
Space heating efficiency (main heating system 1)	178.8797	178.8797	178.8797	178.8797	178.8797	0.0000	0.0000	0.0000	0.0000	178.8797	178.8797	178.8797 (210)
Space heating fuel (main heating system)	148.2028	114.9771	91.9039	48.3823	18.9857	0.0000	0.0000	0.0000	0.0000	49.4162	102.4233	154.9473 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	134.8122	119.1353	126.6520	116.7180	116.3354	106.5036	105.4285	112.5906	111.3999	121.9951	125.2904	132.1978 (64)
Efficiency of water heater	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	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	79.1709	69.9643	74.3787	68.5447	68.3201	62.5462	61.9148	66.1208	65.4216	71.6438	73.5791	77.6356 (219)
Water heating fuel used												839.2406 (219)
Annual totals kWh/year												
Space heating fuel - main system												729.2387 (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)												33.0160 (230a)
Total electricity for the above, kWh/year												33.0160 (231)
Electricity for lighting (calculated in Appendix L)												238.0628 (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												851.5388 (238)

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	729.2387	13.1900	96.1866 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	839.2406	13.1900	110.6958 (247)
Mechanical ventilation fans	33.0160	13.1900	4.3548 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	238.0628	13.1900	31.4005 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-988.0192	13.1900	-130.3197 (252)
Total energy cost			112.3180 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.4927 (257)
SAP rating (Section 12)		93.1272
SAP band		93 (258)
		A

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	729.2387	0.5190	378.4749 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	839.2406	0.5190	435.5659 (264)
Space and water heating			814.0407 (265)
Pumps and fans	33.0160	0.5190	17.1353 (267)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy for lighting	238.0628	0.5190	123.5546 (268)
Energy saving/generation technologies			
PV Unit	-988.0192	0.5190	-512.7820 (269)
Total kg/year			441.9486 (272)
CO2 emissions per m2			8.7100 (273)
EI value			93.8150
EI rating			94 (274)
EI band			A

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

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.7888 = 7.374$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.7888 = 0.2901$, 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	50.7500 (1b)	x 2.3600 (2b)	= 119.7700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.7700 (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	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)			5.8200	1.1450	6.6641		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
100mm Knauf Supafil 34	50.9500	9.6200	41.3300	0.2500	10.3325	52.8000	2182.2240 (29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)
500mm Loft roll	50.7500		50.7500	0.0900	4.5675	9.0000	456.7500 (30)
Total net area of external elements Aum(A, m ²)			118.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3270		(32)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
Timber partition			100.4000			9.0000	903.6000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7900.2740 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							155.6704 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.7387 (36)
Total fabric heat loss					(33) + (36) =		36.0657 (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	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621	19.7621 (38)
Heat transfer coeff	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277	55.8277 (39)
Average = Sum(39)m / 12 =												55.8277 (39)
HLP	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001	1.1001 (40)
HLP (average)												1.1001 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (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	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
171.5013 151.4092 159.5960 143.8758 141.5791 127.3476 123.1042 133.9800 133.3977 149.1513 156.6957 167.6478 (62)												
WWHRS	-36.6891	-32.2740	-32.9440	-27.1578	-25.2437	-20.8440	-17.6757	-21.3895	-21.9978	-27.1561	-31.4052	-35.4500 eq. (G10)
Total of WWHRS savings												-330.2268
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	134.8122	119.1353	126.6520	116.7180	116.3354	106.5036	105.4285	112.5906	111.3999	121.9951	125.2904	132.1978 (64)
Total per year (kWh/year) = Sum (64)m =												1429.0588 (64)
Heat gains from water heating, kWh/month	80.1078	71.1933	76.1493	70.1777	70.1587	64.6821	64.0158	67.6320	66.6937	72.6765	74.4403	78.8266 (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	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319	102.7319 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.7003	29.9323	24.3426	18.4289	13.7758	11.6301	12.5667	16.3347	21.9244	27.8381	32.4912	34.6369 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.6592	224.9697	219.1473	206.7521	191.1054	176.3997	166.5754	164.2649	170.0873	182.4825	198.1292	212.8349 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854	46.9854 (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)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880 (71)
Water heating gains (Table 5)	107.6718	105.9424	102.3512	97.4690	94.2994	89.8363	86.0427	90.9033	92.6302	97.6834	103.3893	105.9497 (72)
Total internal gains	445.2607	442.0738	427.0705	403.8794	380.4099	359.0954	346.4142	352.7322	365.8713	389.2334	415.2391	434.6508 (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			
Northeast				1.0700	12.9236	0.4600	0.0000	0.7700	4.8980 (75)			
Southwest				1.8400	40.4699	0.4600	0.0000	0.7700	26.3754 (79)			
Northwest				2.9100	12.9236	0.4600	0.0000	0.7700	13.3206 (81)			
Northwest				3.8000	12.9236	0.4300	0.0000	0.7700	16.2602 (81)			
Solar gains	60.8541	103.9022	168.1128	261.8807	327.1119	366.7328	341.8657	288.6572	214.1057	130.7033	76.8801	50.1939 (83)
Total gains	506.1147	545.9760	595.1833	665.7602	707.5218	725.8282	688.2799	641.3894	579.9770	519.9367	492.1193	484.8448 (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	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088	39.3088
alpha	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206	3.6206
util living area	0.9393	0.9196	0.8675	0.7546	0.5813	0.3770	0.2502	0.2766	0.5262	0.7872	0.9054	0.9459 (86)
Tweekday	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206
Tweekend	20.2879	20.3822	20.5804	20.7974	20.9389	20.9906	20.9985	20.9978	20.9679	20.8005	20.5161	20.2589
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	19.9009	20.0444	20.3524	20.6837	20.9057	20.9855	20.9977	20.9966	20.9499	20.6921	20.2443	19.8563 (87)
Th 2	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008	20.0008 (88)
util rest of house	0.9280	0.9051	0.8438	0.7144	0.5216	0.3047	0.1702	0.1912	0.4465	0.7415	0.8856	0.9356 (89)
Tweekday	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206
Tweekend	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206
MIT 2	18.5833	18.7884	19.2132	19.6553	19.9154	19.9923	20.0002	19.9998	19.9653	19.6742	19.0845	18.5206 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	19.1348	19.3141	19.6900	20.0857	20.3299	20.4080	20.4176	20.4170	20.3774	20.1002	19.5699	19.0796 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1348	19.3141	19.6900	20.0857	20.3299	20.4080	20.4176	20.4170	20.3774	20.1002	19.5699	19.0796 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9161	0.8933	0.8355	0.7181	0.5419	0.3345	0.2037	0.2270	0.4774	0.7465	0.8757	0.9240 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Useful gains	463.6566	487.7103	497.2906	478.0578	383.3903	242.8244	140.1984	145.5682	276.9053	388.1106	430.9281	447.9922 (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	783.5289	765.6249	686.1218	568.6458	409.2121	246.0861	140.5540	146.1012	289.0402	474.5474	645.9232	780.4481 (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	237.9850	186.7586	140.4904	65.2233	19.2114	0.0000	0.0000	0.0000	0.0000	64.3090	154.7965	247.3472 (98)
Space heating per m2												1116.1213 (98)
												(98) / (4) = 21.9925 (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 %)												178.8797 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												623.9507 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	237.9850	186.7586	140.4904	65.2233	19.2114	0.0000	0.0000	0.0000	0.0000	64.3090	154.7965	247.3472 (98)
Space heating efficiency (main heating system 1)	178.8797	178.8797	178.8797	178.8797	178.8797	0.0000	0.0000	0.0000	0.0000	178.8797	178.8797	178.8797 (210)
Space heating fuel (main heating system)	133.0419	104.4045	78.5390	36.4621	10.7398	0.0000	0.0000	0.0000	0.0000	35.9510	86.5366	138.2757 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	134.8122	119.1353	126.6520	116.7180	116.3354	106.5036	105.4285	112.5906	111.3999	121.9951	125.2904	132.1978 (64)
Efficiency of water heater	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	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	79.1709	69.9643	74.3787	68.5447	68.3201	62.5462	61.9148	66.1208	65.4216	71.6438	73.5791	77.6356 (219)
Water heating fuel used												839.2406 (219)
Annual totals kWh/year												
Space heating fuel - main system												623.9507 (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)												33.0160 (230a)
Total electricity for the above, kWh/year												33.0160 (231)
Electricity for lighting (calculated in Appendix L)												238.0628 (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												687.3973 (238)

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

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	623.9507	16.9600	105.8220 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	839.2406	16.9600	142.3352 (247)
Mechanical ventilation fans	33.0160	16.9600	5.5995 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	238.0628	16.9600	40.3754 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-1046.8728	16.9600	-177.5496 (252)
Total energy cost			116.5826 (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	623.9507	0.5190	323.8304 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	839.2406	0.5190	435.5659 (264)
Space and water heating			759.3963 (265)
Pumps and fans	33.0160	0.5190	17.1353 (267)
Energy for lighting	238.0628	0.5190	123.5546 (268)
Energy saving/generation technologies			
PV Unit	-1046.8728	0.5190	-543.3270 (269)
Total kg/year			356.7592 (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	623.9507	3.0700	1915.5286 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	839.2406	3.0700	2576.4685 (264)
Space and water heating			4491.9972 (265)
Pumps and fans	33.0160	3.0700	101.3592 (267)
Energy for lighting	238.0628	3.0700	730.8527 (268)
Energy saving/generation technologies			
PV Unit	-1046.8728	3.0700	-3213.8994 (269)
Primary energy kWh/year			2110.3097 (272)
Primary energy kWh/m2/year			41.5825 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 93
Current environmental impact rating: A 94

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	Not applicable
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Not applicable
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
L2	Not applicable
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 93
Potential environmental impact rating: A 94

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 £294	Potential £294	Saving £0
Electricity			
Space heating	£111	£111	£0
Water heating	£142	£142	£0
Lighting	£40	£40	£0
Generated (PV)	-£178	-£178	£0
Total cost of fuels	£116	£116	£0
Total cost of uses	£115	£115	£0
Delivered energy	14 kWh/m²	14 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	42 kWh/m²	42 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	South East
Overshading	Average or unknown
Thermal mass parameter	155.7 (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	237.14 (P1)
Transmission heat loss coefficient	36.07 (37)
Summer heat loss coefficient	273.21 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North 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				
North 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
North East	1.0700	98.8453	0.4600	0.0000	0.9000	43.7865
South West	1.8400	119.9223	0.4600	0.0000	0.9000	91.3520
North West	2.9100	98.8453	0.4600	0.0000	0.9000	119.0829
North West	3.8000	98.8453	0.4300	0.0000	0.9000	145.3619
total:						399.5832

Solar gains	Jun	Jul	Aug	
	429	400	337	(P3/P4)
Internal gains	359	346	353	
Total summer gains	788	746	690	(P5)
Summer gain/loss ratio	2.88	2.73	2.53	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 155.7)	0.91	0.91	0.91	
Threshold temperature	19.79	21.54	21.24	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			