

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	1F Apartment (ASHP+PV)				Issued on Date	15/12/2022
Assessment Reference	088	Prop Type Ref	1F Apartment-Det-As			
Property	Plot 088, 1 Bed, K, B					
SAP Rating	95 A	DER	8.71	TER	27.41	
Environmental	95 A	% DER<TER	68.22			
CO ₂ Emissions (t/year)	0.26	DFEE	37.05	TFEE	42.98	
General Requirements Compliance	Pass	% DFEE<TFEE	13.80			
Assessor Details	Mr. Christopher MacDougall, Chris MacDougall, Tel: 02032 902 902, chris.macdougall@aessc.co.uk				Assessor ID	Q920-0001
Client						

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 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) 27.41 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.71 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.26 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.01 (design value)
Maximum 10.0 OK

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

Space heating controls: Time and temperature zone control OK

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

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
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 2.3100 (2b)	= 117.2325 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.2325 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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:												
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	53.0600	9.6200	43.4400	0.2600	11.2944	52.8000	2293.6320 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			70.2000	(26)...(30) + (32) =		27.8568	(31)
Fabric heat loss, W/K = Sum (A x U)			50.7500			70.0000	3552.5000 (32d)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
E-FC-4			103.6600			9.0000	932.9400 (32c)
Timber partition							
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11132.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							219.3501 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2696 (36)
Total fabric heat loss				(33) + (36) =			33.1264 (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	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434 (38)
Heat transfer coeff	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697 (39)
Average = Sum(39)m / 12 =												52.4697 (39)
HLP	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339 (40)
HLP (average)												1.0339 (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				1.8400	11.2829	0.4600	0.0000			0.7700			7.3534 (75)
Southeast				2.9100	36.7938	0.4600	0.0000			0.7700			37.9242 (77)
Southwest				1.0700	36.7938	0.4600	0.0000			0.7700			13.9446 (79)
Southeast				3.8000	36.7938	0.4300	0.0000			0.7700			46.2933 (77)
Solar gains	105.5155	182.1745	255.7468	327.7571	377.0410	378.6804	363.2714	325.8359	280.5800	203.0909	126.8281	90.0115	(83)
Total gains	424.5321	499.5025	563.3468	619.8046	653.5743	640.0395	614.6293	582.0135	544.6214	482.8558	424.6435	401.0983	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	
alpha	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	
util living area	0.9853	0.9679	0.9290	0.8412	0.6922	0.5141	0.3737	0.4115	0.6321	0.8778	0.9697	0.9887 (86)	
Tweekday	18.7951	19.0848	19.4483	19.7929	19.9868	20.0459	20.0542	20.0535	20.0277	19.7806	19.2198	18.7134	
Tweekend	20.3788	20.5099	20.6779	20.8460	20.9517	20.9908	20.9984	20.9975	20.9759	20.8348	20.5693	20.3422	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.0413	20.2419	20.5029	20.7595	20.9255	20.9858	20.9976	20.9961	20.9623	20.7450	20.3274	19.9848 (87)	
Th 2	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552 (88)	
util rest of house	0.9814	0.9599	0.9120	0.8067	0.6367	0.4425	0.2945	0.3286	0.5573	0.8424	0.9607	0.9856 (89)	
Tweekday	18.7951	19.0848	19.4483	19.7929	19.9868	20.0459	20.0542	20.0535	20.0277	19.7806	19.2198	18.7134	
Tweekend	18.7951	19.0848	19.4483	19.7929	19.9868	20.0459	20.0542	20.0535	20.0277	19.7806	19.2198	18.7134	
MIT 2	18.7951	19.0848	19.4483	19.7929	19.9868	20.0459	20.0542	20.0535	20.0277	19.7806	19.2198	18.7134 (90)	
Living area fraction										fLA = Living area / (4) =		0.4185 (91)	
MIT	19.3166	19.5691	19.8897	20.1975	20.3797	20.4393	20.4490	20.4480	20.4188	20.1842	19.6834	19.2455 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3166	19.5691	19.8897	20.1975	20.3797	20.4393	20.4490	20.4480	20.4188	20.1842	19.6834	19.2455 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9775	0.9549	0.9086	0.8123	0.6565	0.4720	0.3277	0.3633	0.5870	0.8478	0.9563	0.9822 (94)	

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Useful gains	414.9979	476.9512	511.8540	503.4526	429.0498	302.1009	201.3953	211.4583	319.6881	409.3481	406.0801	393.9593 (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	787.9189	769.6839	702.5536	592.7763	455.4206	306.3860	201.9582	212.3986	331.5483	502.8803	660.2464	789.4333 (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	277.4532	196.7164	141.8805	64.3131	19.6199	0.0000	0.0000	0.0000	0.0000	69.5879	182.9997	294.2327 (98)
Space heating per m2												1246.8035 (98)
											(98) / (4) =	24.5676 (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 %)												170.7859 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												730.0389 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	277.4532	196.7164	141.8805	64.3131	19.6199	0.0000	0.0000	0.0000	0.0000	69.5879	182.9997	294.2327 (98)
Space heating efficiency (main heating system 1)	170.7859	170.7859	170.7859	170.7859	170.7859	0.0000	0.0000	0.0000	0.0000	170.7859	170.7859	170.7859 (210)
Space heating fuel (main heating system)	162.4567	115.1831	83.0751	37.6572	11.4880	0.0000	0.0000	0.0000	0.0000	40.7457	107.1515	172.2816 (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												730.0389 (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)												32.3165 (230a)
Total electricity for the above, kWh/year												32.3165 (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												851.6395 (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	730.0389	0.5190	378.8902 (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			814.4560 (265)
Pumps and fans	32.3165	0.5190	16.7723 (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			442.0009 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			8.7100 (273)

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

DER		8.7100 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		29.2836 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		29.2836 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 2.3100 (2b)	= 117.2325 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.2325 (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) = 0.1706 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4206 (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) = 0.3891 (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												
	0.4960	0.4863	0.4766	0.4280	0.4182	0.3696	0.3696	0.3599	0.3891	0.4182	0.4377	0.4571 (22b)
Effective ac	0.6230	0.6183	0.6136	0.5916	0.5875	0.5683	0.5683	0.5648	0.5757	0.5875	0.5958	0.6045 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.9800	1.0000	1.9800			(26)				
TER Opening Type (Uw = 1.40)			9.6200	1.3258	12.7538			(27)				
100mm Knauf Supafil 34	53.0600	9.6200	43.4400	0.1800	7.8192			(29a)				
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1800	2.7288			(29a)				
Total net area of external elements Aum(A, m2)			70.2000					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 25.2818			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.4339 (36)				
Total fabric heat loss						(33) + (36) =	31.7157	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.1030	23.9182	23.7370	22.8861	22.7269	21.9858	21.9858	21.8485	22.2713	22.7269	23.0490	23.3857 (38)
	55.8187	55.6339	55.4527	54.6018	54.4426	53.7015	53.7015	53.5642	53.9870	54.4426	54.7647	55.1014 (39)
Average = Sum(39)m / 12 =												54.6010 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0999	1.0962	1.0927	1.0759	1.0728	1.0582	1.0582	1.0555	1.0638	1.0728	1.0791	1.0857 (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												
Average daily hot water use (litres/day)												1.7122 (42)
												74.8647 (43)
Daily hot water use												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 (56)
Primary 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 (57)
Total heat required for water heating calculated for each month	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)
Solar input	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)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	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)
	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			1.8400		11.2829		0.6300		0.7000		0.7700		6.3447 (75)
Southeast			6.7100		36.7938		0.6300		0.7000		0.7700		75.4518 (77)
Southwest			1.0700		36.7938		0.6300		0.7000		0.7700		12.0318 (79)
Solar gains	93.8283	161.9317	227.1598	290.8448	334.3345	335.6839	322.0674	289.0462	249.1242	180.4784	112.7684		80.0491 (83)
Total gains	417.5107	483.9257	539.4257	587.5582	615.5337	601.7088	578.0912	549.8897	517.8315	464.9091	415.2497		395.8018 (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	63.1384	63.3482	63.5551	64.5456	64.7343	65.6277	65.6277	65.7959	65.2807	64.7343	64.3536	63.9604
alpha	5.2092	5.2232	5.2370	5.3030	5.3156	5.3752	5.3752	5.3864	5.3520	5.3156	5.2902	5.2640
util living area	0.9915	0.9811	0.9556	0.8863	0.7497	0.5588	0.4068	0.4448	0.6799	0.9119	0.9812	0.9934 (86)
MIT	20.0322	20.2134	20.4603	20.7375	20.9158	20.9859	20.9978	20.9966	20.9615	20.7330	20.3367	20.0029 (87)
Th 2	20.0009	20.0039	20.0068	20.0206	20.0231	20.0352	20.0352	20.0374	20.0305	20.0231	20.0179	20.0125 (88)
util rest of house	0.9889	0.9755	0.9424	0.8548	0.6916	0.4799	0.3186	0.3535	0.5994	0.8800	0.9744	0.9914 (89)
MIT 2	18.7330	18.9960	19.3477	19.7323	19.9477	20.0266	20.0344	20.0361	20.0036	19.7375	19.1865	18.6991 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	19.2767	19.5055	19.8134	20.1530	20.3529	20.4281	20.4376	20.4381	20.4045	20.1541	19.6679	19.2448 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2767	19.5055	19.8134	20.1530	20.3529	20.4281	20.4376	20.4381	20.4045	20.1541	19.6679	19.2448 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9864	0.9719	0.9394	0.8595	0.7122	0.5126	0.3556	0.3918	0.6317	0.8849	0.9714	0.9892 (94)
Useful gains	411.8187	470.3229	506.7173	505.0309	438.3653	308.4323	205.5670	215.4325	327.0936	411.3891	403.3847	391.5386 (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	835.9823	812.5595	738.2635	614.4333	471.0851	312.9773	206.0862	216.2963	340.3610	520.1527	688.2752	828.9873 (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	315.5778	229.9830	172.2704	78.7697	24.3436	0.0000	0.0000	0.0000	0.0000	80.9201	205.1211	325.4618 (98)
Space heating												1432.4475 (98)
Space heating per m2										(98) / (4) =		28.2256 (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													1532.0294 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	315.5778	229.9830	172.2704	78.7697	24.3436	0.0000	0.0000	0.0000	0.0000	80.9201	205.1211	325.4618	(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)	337.5163	245.9711	184.2464	84.2456	26.0359	0.0000	0.0000	0.0000	0.0000	86.5456	219.3809	348.0875	(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	86.3972	85.9020	84.9920	83.2594	81.1954	79.8000	79.8000	79.8000	79.8000	83.2382	85.5078	79.8000	(216)
Fuel for water heating, kWh/month	200.2963	177.8871	189.6004	174.6050	176.2764	161.4623	156.2073	169.8362	169.0438	181.0473	185.0065	195.5327	(219)
Water heating fuel used												2136.8015	(219)
Annual totals kWh/year													
Space heating fuel - main system												1532.0294	(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												3981.8937	(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	1532.0294	0.2160	330.9184 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2136.8015	0.2160	461.5491 (264)
Space and water heating			792.4675 (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			954.9471 (272)
Emissions per m2 for space and water heating			15.6151 (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) = (15.6151 * 1.55) + 2.4346 + 0.7670, rounded to 2 d.p.			27.4100 (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 2.3100 (2b)	= 117.2325 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.2325 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1706 (8)
Measured/design AP50					Yes
Infiltration rate					4.0100
Number of sides sheltered					0.3711 (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) =				0.3433 (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	0.4377	0.4291	0.4205	0.3776	0.3690	0.3261	0.3261	0.3175	0.3433	0.3690	0.3862	0.4033 (22b)
	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5813 (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	53.0600	9.6200	43.4400	0.2600	11.2944	52.8000	2293.6320 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum, m ²			70.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.8568		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
E-FC-4			50.7500			30.0000	1522.5000 (32b)
Timber partition			103.6600			9.0000	932.9400 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9102.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							179.3501 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2696 (36)
Total fabric heat loss							(33) + (36) = 33.1264 (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	23.0486	22.9048	22.7637	22.1013	21.9774	21.4004	21.4004	21.2936	21.6227	21.9774	22.2281	22.4902 (38)
Heat transfer coeff	56.1750	56.0311	55.8901	55.2277	55.1037	54.5268	54.5268	54.4200	54.7490	55.1037	55.3545	55.6166 (39)
Average = Sum(39)m / 12 =												55.2271 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1069	1.1041	1.1013	1.0882	1.0858	1.0744	1.0744	1.0723	1.0788	1.0858	1.0907	1.0959 (40)
HLP (average)												1.0882 (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:												

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	1.8400	11.2829	0.4600	0.0000	0.7700	7.3534	(75)
Southeast	2.9100	36.7938	0.4600	0.0000	0.7700	37.9242	(77)
Southwest	1.0700	36.7938	0.4600	0.0000	0.7700	13.9446	(79)
Southeast	3.8000	36.7938	0.4300	0.0000	0.7700	46.2933	(77)

Solar gains	105.5155	182.1745	255.7468	327.7571	377.0410	378.6804	363.2714	325.8359	280.5800	203.0909	126.8281	90.0115	(83)
Total gains	351.7413	427.3358	492.4761	550.6960	585.6096	573.6855	549.6445	515.2745	477.2591	413.6698	353.3982	328.9290	(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	45.0083	45.1238	45.2377	45.7803	45.8833	46.3687	46.3687	46.4598	46.1805	45.8833	45.6754	45.4602	
alpha	4.0006	4.0083	4.0158	4.0520	4.0589	4.0912	4.0912	4.0973	4.0787	4.0589	4.0450	4.0307	
util living area	0.9876	0.9730	0.9422	0.8712	0.7455	0.5744	0.4281	0.4725	0.7000	0.9083	0.9763	0.9903	(86)
MIT	19.5779	19.8286	20.1650	20.5443	20.8164	20.9529	20.9888	20.9834	20.8942	20.5225	19.9744	19.5311	(87)
Th 2	19.9952	19.9975	19.9998	20.0105	20.0125	20.0218	20.0218	20.0235	20.0182	20.0125	20.0084	20.0042	(88)
util rest of house	0.9846	0.9669	0.9290	0.8429	0.6938	0.4982	0.3367	0.3780	0.6267	0.8814	0.9698	0.9880	(89)
MIT 2	18.7065	18.9551	19.2839	19.6492	19.8873	19.9979	20.0182	20.0177	19.9578	19.6397	19.1100	18.6671	(90)
Living area fraction									fLA = Living area / (4) =			0.4185	(91)
MIT	19.0712	19.3207	19.6527	20.0238	20.2761	20.3976	20.4244	20.4218	20.3497	20.0092	19.4718	19.0287	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0712	19.3207	19.6527	20.0238	20.2761	20.3976	20.4244	20.4218	20.3497	20.0092	19.4718	19.0287	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9811	0.9618	0.9237	0.8433	0.7085	0.5283	0.3749	0.4173	0.6529	0.8813	0.9655	0.9851	(94)
Ext temp.	345.1106	410.9943	454.9013	464.4135	414.8818	303.1032	206.0599	215.0493	311.5972	364.5672	341.1923	324.0164	(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	829.7721	808.0055	735.1044	614.3410	472.5779	316.1226	208.5321	218.8686	342.1639	518.4831	684.8317	824.7214	(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	360.5881	266.7916	208.4711	107.9478	42.9259	0.0000	0.0000	0.0000	0.0000	114.5134	247.4203	372.5245	(98)
												1721.1826	(98)
												33.9149	(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	512.5519	403.4983	413.5916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9177	0.9539	0.9412	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	470.3706	384.8943	389.2736	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	735.3549	706.0323	666.8404	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	190.7888	238.9267	206.5097	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												636.2251 (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	47.6972	59.7317	51.6274	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												159.0563 (107)
Space cooling per m2												3.1341 (108)
Energy for space heating												33.9149 (99)
Energy for space cooling												3.1341 (108)
Total												37.0490 (109)
Dwelling Fabric Energy Efficiency (DFEE)												37.0 (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 2.3100 (2b)	= 117.2325 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.2325 (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) = 0.1706 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4206 (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) = 0.3891 (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												
	0.4960	0.4863	0.4766	0.4280	0.4182	0.3696	0.3696	0.3599	0.3891	0.4182	0.4377	0.4571 (22b)
Effective ac	0.6230	0.6183	0.6136	0.5916	0.5875	0.5683	0.5683	0.5648	0.5757	0.5875	0.5958	0.6045 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings		NetArea		U-value		A x U		K-value		A x K	
	m2		m2		m2		W/m2K		W/K		kJ/m2K		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	53.0600	9.6200	43.4400	0.1800	7.8192								(29a)	
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1800	2.7288								(29a)	
Total net area of external elements Aum(A, m2)			70.2000										(31)	
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.2818								(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K														250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														6.4339 (36)
Total fabric heat loss												(33) + (36) =	31.7157 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)														
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat transfer coeff	24.1030	23.9182	23.7370	22.8861	22.7269	21.9858	21.9858	21.8485	22.2713	22.7269	23.0490	23.3857	(38)	
	55.8187	55.6339	55.4527	54.6018	54.4426	53.7015	53.7015	53.5642	53.9870	54.4426	54.7647	55.1014	(39)	
Average = Sum(39)m / 12 =												54.6010	(39)	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.0999	1.0962	1.0927	1.0759	1.0728	1.0582	1.0582	1.0555	1.0638	1.0728	1.0791	1.0857	(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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	1.8400			11.2829		0.6300		0.7000		0.7700		6.3447 (75)	
Southeast	6.7100			36.7938		0.6300		0.7000		0.7700		75.4518 (77)	
Southwest	1.0700			36.7938		0.6300		0.7000		0.7700		12.0318 (79)	
Solar gains	93.8283	161.9317	227.1598	290.8448	334.3345	335.6839	322.0674	289.0462	249.1242	180.4784	112.7684	80.0491	(83)
Total gains	340.0540	407.0931	463.8892	513.7837	542.9031	530.6890	508.4405	478.4848	445.8034	391.0573	339.3385	318.9666	(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	63.1384	63.3482	63.5551	64.5456	64.7343	65.6277	65.6277	65.7959	65.2807	64.7343	64.3536	63.9604		
Feb	5.2092	5.2232	5.2370	5.3030	5.3156	5.3752	5.3752	5.3864	5.3520	5.3156	5.2902	5.2640		
util living area	0.9967	0.9911	0.9755	0.9263	0.8109	0.6241	0.4607	0.5078	0.7584	0.9521	0.9922	0.9976	(86)	
MIT	19.8920	20.0801	20.3426	20.6534	20.8760	20.9765	20.9961	20.9936	20.9353	20.6361	20.2041	19.8625	(87)	
Th 2	20.0009	20.0039	20.0068	20.0206	20.0231	20.0352	20.0352	20.0374	20.0305	20.0231	20.0179	20.0125	(88)	
util rest of house	0.9956	0.9882	0.9674	0.9026	0.7571	0.5398	0.3618	0.4053	0.6790	0.9315	0.9892	0.9968	(89)	
MIT 2	18.9964	19.1853	19.4454	19.7514	19.9441	20.0250	20.0342	20.0357	19.9977	19.7439	19.3210	18.9764	(90)	
Living area fraction										fLA = Living area / (4) =		0.4185	(91)	
MIT	19.3713	19.5598	19.8209	20.1289	20.3341	20.4232	20.4368	20.4366	20.3901	20.1173	19.6906	19.3472	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.3713	19.5598	19.8209	20.1289	20.3341	20.4232	20.4368	20.4366	20.3901	20.1173	19.6906	19.3472	(93)	

8. Space heating requirement

Utilisation	0.9947	0.9865	0.9656	0.9055	0.7754	0.5747	0.4034	0.4484	0.7103	0.9339	0.9879	0.9961	(94)	
Useful gains	338.2385	401.6107	447.9154	465.2527	420.9782	304.9654	205.0832	214.5630	316.6592	365.1925	335.2412	317.7174	(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	841.2584	815.5810	738.6784	613.1193	470.0632	312.7144	206.0405	216.2161	339.5823	518.1487	689.5188	834.6327	(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	374.2467	278.1880	216.3277	106.4640	36.5192	0.0000	0.0000	0.0000	0.0000	113.7995	255.0799	384.5849	(98)	
Space heating												1765.2099	(98)	
Space heating per m2										(98) / (4) =		34.7825	(99)	

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b														
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	504.7939	397.3910	407.0882	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9405	0.9725	0.9627	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	474.7835	386.4785	391.9026	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	685.0993	657.8718	623.8394	0.0000	0.0000	0.0000	0.0000	(103)	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	151.4273	201.9166	172.5610	0.0000	0.0000	0.0000	0.0000	(104)	
Space cooling												525.9050	(104)	
Cooled fraction												1.0000	(105)	
Intermittency factor (Table 10b)														

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	37.8568	50.4792	43.1403	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												131.4762 (107)
Energy for space heating												2.5907 (108)
Energy for space cooling												34.7825 (99)
Total												2.5907 (108)
Target Fabric Energy Efficiency (TFEE)												37.3731 (109)
												43.0 (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 2.3100 (2b)	= 117.2325 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.2325 (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:												
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	53.0600	9.6200	43.4400	0.2600	11.2944	52.8000	2293.6320 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			70.2000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.8568	(33)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			103.6600			9.0000	932.9400 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	11132.0200 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							219.3501 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2696 (36)
Total fabric heat loss					(33) + (36) =	33.1264 (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	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434 (38)
Heat transfer coeff	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697 (39)
Average = Sum(39)m / 12 =												52.4697 (39)
HLP	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339 (40)
HLP (average)												1.0339 (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												1759.2857 (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			1.8400		12.9236		0.4600		0.0000		0.7700		8.4226 (75)
Southeast			2.9100		40.4699		0.4600		0.0000		0.7700		41.7132 (77)
Southwest			1.0700		40.4699		0.4600		0.0000		0.7700		15.3379 (79)
Southeast			3.8000		40.4699		0.4300		0.0000		0.7700		50.9184 (77)
Solar gains	116.3922	180.9542	251.6733	334.2187	376.3956	405.4047	384.3606	351.1673	299.8833	215.5616	143.3409		98.3281 (83)
Total gains	561.6528	623.0280	678.7438	738.0982	756.8056	764.5001	730.7748	703.8995	665.7546	604.7950	558.5800		532.9790 (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	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336
alpha	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289
util living area	0.9486	0.9191	0.8514	0.7204	0.5407	0.3420	0.2225	0.2384	0.4518	0.7370	0.9025	0.9573 (86)
Tweekday	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948
Tweekend	20.5910	20.6807	20.8160	20.9313	20.9857	20.9988	20.9999	20.9999	20.9952	20.9356	20.7586	20.5605
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.3688	20.5061	20.7160	20.8927	20.9779	20.9982	20.9998	20.9998	20.9925	20.9006	20.6231	20.3216 (87)
Th 2	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552 (88)
util rest of house	0.9366	0.9016	0.8221	0.6748	0.4817	0.2780	0.1547	0.1681	0.3806	0.6831	0.8785	0.9470 (89)
Tweekday	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948
Tweekend	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948
MIT 2	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	19.7242	19.8924	20.1423	20.3436	20.4313	20.4493	20.4505	20.4505	20.4450	20.3545	20.0395	19.6664 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7242	19.8924	20.1423	20.3436	20.4313	20.4493	20.4505	20.4505	20.4450	20.3545	20.0395	19.6664 (93)

8. Space heating requirement

Utilisation	0.9317	0.8982	0.8250	0.6893	0.5055	0.3048	0.1831	0.1975	0.4102	0.7010	0.8781	0.9419 (94)
Useful gains	523.2794	559.6246	559.9662	508.7467	382.5793	232.9867	133.8002	139.0329	273.1186	423.9454	490.4838	502.0364 (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	767.3290	749.9160	668.5829	547.9716	389.9165	233.4556	133.8256	139.0706	275.2046	459.3447	631.7069	764.2941 (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	181.5729	127.8758	80.8108	28.2419	5.4589	0.0000	0.0000	0.0000	0.0000	26.3371	101.6807	195.1197 (98)
Space heating												747.0978 (98)
RHI space heating demand												747 (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 2.3100 (2b)	= 117.2325 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.2325 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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:												
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	53.0600	9.6200	43.4400	0.2600	11.2944	52.8000	2293.6320 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			70.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.8568		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			103.6600			9.0000	932.9400 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11132.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							219.3501 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2696 (36)
Total fabric heat loss				(33) + (36) =			33.1264 (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	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434 (38)
Heat transfer coeff	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697 (39)
Average = Sum(39)m / 12 =												52.4697 (39)
HLP	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339 (40)
HLP (average)												1.0339 (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	1.8400	11.2829	0.4600	0.0000	0.7700	7.3534 (75)
Southeast	2.9100	36.7938	0.4600	0.0000	0.7700	37.9242 (77)
Southwest	1.0700	36.7938	0.4600	0.0000	0.7700	13.9446 (79)
Southeast	3.8000	36.7938	0.4300	0.0000	0.7700	46.2933 (77)

Solar gains	105.5155	182.1745	255.7468	327.7571	377.0410	378.6804	363.2714	325.8359	280.5800	203.0909	126.8281	90.0115 (83)
Total gains	550.7762	624.2483	682.8173	731.6366	757.4509	737.7758	709.6856	678.5682	646.4513	592.3243	542.0672	524.6623 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336
alpha	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289
util living area	0.9598	0.9295	0.8729	0.7675	0.6159	0.4500	0.3244	0.3543	0.5454	0.7955	0.9282	0.9671 (86)
Tweekday	19.1234	19.3656	19.6485	19.8919	20.0153	20.0501	20.0547	20.0544	20.0412	19.8962	19.4823	19.0452
Tweekend	20.5285	20.6412	20.7765	20.9005	20.9709	20.9948	20.9992	20.9987	20.9872	20.8990	20.6932	20.4926
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2722	20.4449	20.6551	20.8446	20.9551	20.9920	20.9987	20.9980	20.9800	20.8441	20.5209	20.2168 (87)
Th 2	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552 (88)
util rest of house	0.9504	0.9144	0.8478	0.7274	0.5616	0.3857	0.2552	0.2822	0.4763	0.7503	0.9101	0.9593 (89)
Tweekday	19.1234	19.3656	19.6485	19.8919	20.0153	20.0501	20.0547	20.0544	20.0412	19.8962	19.4823	19.0452
Tweekend	19.1234	19.3656	19.6485	19.8919	20.0153	20.0501	20.0547	20.0544	20.0412	19.8962	19.4823	19.0452
MIT 2	19.1234	19.3656	19.6485	19.8919	20.0153	20.0501	20.0547	20.0544	20.0412	19.8962	19.4823	19.0452 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	19.6042	19.8174	20.0698	20.2906	20.4086	20.4443	20.4498	20.4493	20.4341	20.2929	19.9170	19.5356 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6042	19.8174	20.0698	20.2906	20.4086	20.4443	20.4498	20.4493	20.4341	20.2929	19.9170	19.5356 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9452	0.9101	0.8482	0.7379	0.5824	0.4124	0.2842	0.3124	0.5045	0.7624	0.9071	0.9541 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Useful gains	520.5699	568.1285	579.1953	539.8499	441.1359	304.2715	201.7019	211.9878	326.1483	451.5696	491.7213	500.5734 (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	803.0080	782.7099	712.0023	597.6639	456.9392	306.6506	201.9972	212.4653	332.3493	508.5855	672.5037	804.6541 (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	210.1339	144.1987	98.8084	41.6261	11.7577	0.0000	0.0000	0.0000	0.0000	42.4198	130.1634	226.2360 (98)
Space heating per m2										(98) / (4) =		17.8393 (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 %)												170.7859 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												530.1047 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	210.1339	144.1987	98.8084	41.6261	11.7577	0.0000	0.0000	0.0000	0.0000	42.4198	130.1634	226.2360 (98)
Space heating efficiency (main heating system 1)	170.7859	170.7859	170.7859	170.7859	170.7859	0.0000	0.0000	0.0000	0.0000	170.7859	170.7859	170.7859 (210)
Space heating fuel (main heating system)	123.0394	84.4324	57.8551	24.3733	6.8845	0.0000	0.0000	0.0000	0.0000	24.8380	76.2144	132.4676 (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												530.1047 (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)												32.3165 (230a)
Total electricity for the above, kWh/year												32.3165 (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												651.7053 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	530.1047	13.1900	69.9208 (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	32.3165	13.1900	4.2626 (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			85.9599 (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		0.3771 (257)
SAP rating (Section 12)		94.7401
SAP band		95 (258)
		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	530.1047	0.5190	275.1243 (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			710.6902 (265)
Pumps and fans	32.3165	0.5190	16.7723 (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			338.2351 (272)
CO2 emissions per m2			6.6600 (273)
EI value			95.2665
EI rating			95 (274)
EI band			A

Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.7079 = 7.723$, stars = 2
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.7079 = 0.3039$, 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 2.3100 (2b)	= 117.2325 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.2325 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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:												
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	53.0600	9.6200	43.4400	0.2600	11.2944	52.8000	2293.6320 (29a)
E-WM-30 WTS	17.1400	1.9800	15.1600	0.1900	2.8804	52.8000	800.4480 (29a)
Total net area of external elements Aum(A, m ²)			70.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.8568		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32d)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			103.6600			9.0000	932.9400 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11132.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							219.3501 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2696 (36)
Total fabric heat loss				(33) + (36) =			33.1264 (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	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434	19.3434 (38)
Heat transfer coeff	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697	52.4697 (39)
Average = Sum(39)m / 12 =												52.4697 (39)
HLP	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339	1.0339 (40)
HLP (average)												1.0339 (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				1.8400	12.9236	0.4600	0.0000	0.7700	8.4226 (75)			
Southeast				2.9100	40.4699	0.4600	0.0000	0.7700	41.7132 (77)			
Southwest				1.0700	40.4699	0.4600	0.0000	0.7700	15.3379 (79)			
Southeast				3.8000	40.4699	0.4300	0.0000	0.7700	50.9184 (77)			

Solar gains	116.3922	180.9542	251.6733	334.2187	376.3956	405.4047	384.3606	351.1673	299.8833	215.5616	143.3409	98.3281 (83)
Total gains	561.6528	623.0280	678.7438	738.0982	756.8056	764.5001	730.7748	703.8995	665.7546	604.7950	558.5800	532.9790 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336	58.9336
alpha	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289	4.9289
util living area	0.9486	0.9191	0.8514	0.7204	0.5407	0.3420	0.2225	0.2384	0.4518	0.7370	0.9025	0.9573 (86)
Tweekday	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948
Tweekend	20.5910	20.6807	20.8160	20.9313	20.9857	20.9988	20.9999	20.9999	20.9952	20.9356	20.7586	20.5605
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.3688	20.5061	20.7160	20.8927	20.9779	20.9982	20.9998	20.9998	20.9925	20.9006	20.6231	20.3216 (87)
Th 2	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552	20.0552 (88)
util rest of house	0.9366	0.9016	0.8221	0.6748	0.4817	0.2780	0.1547	0.1681	0.3806	0.6831	0.8785	0.9470 (89)
Tweekday	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948
Tweekend	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948
MIT 2	19.2603	19.4506	19.7293	19.9483	20.0378	20.0543	20.0552	20.0551	20.0509	19.9614	19.6194	19.1948 (90)
Living area fraction										fLA = Living area / (4) =		0.4185 (91)
MIT	19.7242	19.8924	20.1423	20.3436	20.4313	20.4493	20.4505	20.4505	20.4450	20.3545	20.0395	19.6664 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7242	19.8924	20.1423	20.3436	20.4313	20.4493	20.4505	20.4505	20.4450	20.3545	20.0395	19.6664 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9317	0.8982	0.8250	0.6893	0.5055	0.3048	0.1831	0.1975	0.4102	0.7010	0.8781	0.9419 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Useful gains	523.2794	559.6246	559.9662	508.7467	382.5793	232.9867	133.8002	139.0329	273.1186	423.9454	490.4838	502.0364 (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	767.3290	749.9160	668.5829	547.9716	389.9165	233.4556	133.8256	139.0706	275.2046	459.3447	631.7069	764.2941 (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	181.5729	127.8758	80.8108	28.2419	5.4589	0.0000	0.0000	0.0000	0.0000	26.3371	101.6807	195.1197 (98)
Space heating per m2											(98) / (4) =	14.7211 (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 %)												170.7859 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												437.4470 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	181.5729	127.8758	80.8108	28.2419	5.4589	0.0000	0.0000	0.0000	0.0000	26.3371	101.6807	195.1197 (98)
Space heating efficiency (main heating system 1)	170.7859	170.7859	170.7859	170.7859	170.7859	0.0000	0.0000	0.0000	0.0000	170.7859	170.7859	170.7859 (210)
Space heating fuel (main heating system)	106.3161	74.8749	47.3170	16.5364	3.1964	0.0000	0.0000	0.0000	0.0000	15.4211	59.5369	114.2481 (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	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)
Fuel for water heating, kWh/month												839.2406 (219)
Water heating fuel used												437.4470 (211)
Annual totals kWh/year												0.0000 (215)
Space heating fuel - main system												
Space heating fuel - secondary												
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)												32.3165 (230a)
Total electricity for the above, kWh/year												32.3165 (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												500.1941 (238)

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

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	437.4470	16.9600	74.1910 (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	32.3165	16.9600	5.4809 (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			84.8329 (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	437.4470	0.5190	227.0350 (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			662.6008 (265)
Pumps and fans	32.3165	0.5190	16.7723 (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			259.6007 (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	437.4470	3.0700	1342.9623 (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			3919.4308 (265)
Pumps and fans	32.3165	3.0700	99.2118 (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			1535.5959 (272)
Primary energy kWh/m2/year			30.2580 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: A 95
Current environmental impact rating: A 95

(For testing purposes):

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

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

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

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 95

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 £262	Potential £262	Saving £0
Electricity			
Space heating	£80	£80	£0
Water heating	£142	£142	£0
Lighting	£40	£40	£0
Generated (PV)	-£178	-£178	£0
Total cost of fuels	£84	£84	£0
Total cost of uses	£84	£84	£0
Delivered energy	10 kWh/m²	10 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	30 kWh/m²	30 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

No improvements selected / applicable

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	Detached Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North West
Overshading	Average or unknown
Thermal mass parameter	219.4 (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	232.12 (P1)
Transmission heat loss coefficient	33.13 (37)
Summer heat loss coefficient	265.25 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North East	0.000	1.000	None
South East	0.000	1.000	None
South 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 East	1.000	0.90	1.000	0.900 (P8)
South 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	1.8400	98.8453	0.4600	0.0000	0.9000	75.2964
South East	2.9100	119.9223	0.4600	0.0000	0.9000	144.4752
South West	1.0700	119.9223	0.4600	0.0000	0.9000	53.1232
South East	3.8000	119.9223	0.4300	0.0000	0.9000	176.3578
total:						449.2526

Solar gains	Jun	Jul	Aug	
	474	449	410	(P3/P4)
Internal gains	359	346	353	
Total summer gains	833	796	763	(P5)
Summer gain/loss ratio	3.14	3.00	2.88	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 219.4)	0.46	0.46	0.46	
Threshold temperature	19.60	21.36	21.14	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			