

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	GF Apartment (ASHP)				Issued on Date	15/12/2022
Assessment Reference	087	Prop Type Ref	GF Apartment-Det-As			
Property	Plot 087, 1 Bed, K, B					
SAP Rating		86 B	DER	20.32	TER	31.22
Environmental		87 B	% DER<TER	34.92		
CO ₂ Emissions (t/year)		0.87	DFEE	46.66	TFEE	56.14
General Requirements Compliance		Pass	% DFEE<TFEE	16.89		
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

Ground-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 31.22 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.32 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.26 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

Space heating controls: Time and temperature zone control OK

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): Medium 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: 2.15 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.90 W/m²K

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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 2.3200 (2b)	= 117.7400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.7400 (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)			6.9000	1.1450	7.9008		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Slab on ground			50.7500	0.1100	5.5825	110.0000	5582.5000 (28a)
100mm Knauf Supafil 34	56.5200	10.7000	45.8200	0.2600	11.9132	52.8000	2419.2960 (29a)
E-WM-30 WTS	18.3100	1.9800	16.3300	0.1900	3.1027	52.8000	862.2240 (29a)
Total net area of external elements Aum(A, m ²)					125.5800		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5170		(33)
E-FC-4				50.7500		70.0000	3552.5000 (32b)
Timber partition				111.6800		9.0000	1005.1200 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			13421.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							264.4658 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9957 (36)
Total fabric heat loss				(33) + (36) =			43.5128 (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	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271 (38)
Heat transfer coeff	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399 (39)
Average = Sum(39)m / 12 =												62.9399 (39)
HLP	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402 (40)
HLP (average)												1.2402 (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	13.3325	11.8418	9.6304	7.2908	5.4500	4.6011	4.9717	6.4623	8.6737	11.0133	12.8542	13.7030	(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	318.8690	317.1969	307.4933	291.9668	276.4729	261.3081	251.3029	256.1061	263.9454	279.6430	297.6731	310.9351	(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					2.1500	36.7938	0.4600	0.0000	0.7700		28.0196 (79)	
Southeast					3.8000	36.7938	0.4300	0.0000	0.7700		46.2933 (77)	

Solar gains	119.5905	206.1494	288.5503	368.4022	422.5668	423.8770	406.8458	365.7691	316.0992	229.5882	143.6867	102.0567 (83)
Total gains	438.4595	523.3463	596.0436	660.3690	699.0398	685.1852	658.1487	621.8751	580.0446	509.2312	441.3597	412.9918 (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)													
tau	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	
alpha	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	
util living area	0.9923	0.9813	0.9542	0.8853	0.7506	0.5696	0.4174	0.4598	0.6940	0.9174	0.9829	0.9942	(86)
Tweekday	18.4917	18.7830	19.1668	19.5564	19.7967	19.8756	19.8868	19.8859	19.8511	19.5446	18.9336	18.4140	
Tweekend	20.3062	20.4371	20.6127	20.8007	20.9317	20.9859	20.9975	20.9960	20.9643	20.7889	20.5033	20.2715	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	19.9292	20.1292	20.4023	20.6888	20.8946	20.9784	20.9961	20.9938	20.9442	20.6742	20.2244	19.8757	(87)
Th 2	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	(88)
util rest of house	0.9896	0.9751	0.9395	0.8505	0.6860	0.4786	0.3137	0.3517	0.6031	0.8837	0.9762	0.9922	(89)
Tweekday	18.4917	18.7830	19.1668	19.5564	19.7967	19.8756	19.8868	19.8859	19.8511	19.5446	18.9336	18.4140	
Tweekend	18.4917	18.7830	19.1668	19.5564	19.7967	19.8756	19.8868	19.8859	19.8511	19.5446	18.9336	18.4140	
MIT 2	18.4917	18.7830	19.1668	19.5564	19.7967	19.8756	19.8868	19.8859	19.8511	19.5446	18.9336	18.4140	(90)
Living area fraction									fLA = Living area / (4) =			0.4179	(91)
MIT	19.0925	19.3457	19.6831	20.0297	20.2555	20.3365	20.3504	20.3489	20.3079	20.0167	19.4731	19.0249	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0925	19.3457	19.6831	20.0297	20.2555	20.3365	20.3504	20.3489	20.3079	20.0167	19.4731	19.0249	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9871	0.9713	0.9363	0.8555	0.7086	0.5162	0.3572	0.3971	0.6392	0.8883	0.9730	0.9901	(94)

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Useful gains	432.8116	508.3501	558.0805	564.9180	495.3549	353.7200	235.1023	246.9433	370.7767	452.3269	429.4436	408.8832 (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	931.0351	909.2081	829.7448	700.4995	538.4830	361.0516	236.0512	248.5446	390.7255	592.6858	778.7590	933.0749 (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	370.6783	269.3766	202.1182	97.6187	32.0873	0.0000	0.0000	0.0000	0.0000	104.4270	251.5071	389.9987 (98)
Space heating per m2												1717.8119 (98)
										(98) / (4) =		33.8485 (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 %)												195.2148 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												879.9598 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	370.6783	269.3766	202.1182	97.6187	32.0873	0.0000	0.0000	0.0000	0.0000	104.4270	251.5071	389.9987 (98)
Space heating efficiency (main heating system 1)	195.2148	195.2148	195.2148	195.2148	195.2148	0.0000	0.0000	0.0000	0.0000	195.2148	195.2148	195.2148 (210)
Space heating fuel (main heating system)	189.8823	137.9898	103.5363	50.0058	16.4369	0.0000	0.0000	0.0000	0.0000	53.4934	128.8361	199.7792 (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												879.9598 (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)												32.4564 (230a)
Total electricity for the above, kWh/year												32.4564 (231)
Electricity for lighting (calculated in Appendix L)												235.4560 (232)
Total delivered energy for all uses												1987.1128 (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	879.9598	0.5190	456.6992 (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			892.2650 (265)
Pumps and fans	32.4564	0.5190	16.8449 (267)
Energy for lighting	235.4560	0.5190	122.2016 (268)
Total CO2, kg/year			1031.3115 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.3200 (273)

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

DER		20.3200 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		40.8936 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		40.8936 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 2.3200 (2b)	= 117.7400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.7400 (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) = 0.1699 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4199 (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) =				0.3884 (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	0.4952	0.4855	0.4758	0.4272	0.4175	0.3690	0.3690	0.3592	0.3884	0.4175	0.4369	0.4563 (22b)
Effective ac	0.6226	0.6178	0.6132	0.5913	0.5872	0.5681	0.5681	0.5645	0.5754	0.5872	0.5955	0.6041 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Opening Type (Uw = 1.40)			10.7000	1.3258	14.1856		(27)
Slab on ground			50.7500	0.1300	6.5975		(28a)
100mm Knauf Supafil 34	56.5200	10.7000	45.8200	0.1800	8.2476		(29a)
E-WM-30 WTS	18.3100	1.9800	16.3300	0.1800	2.9394		(29a)
Total net area of external elements Aum, m ²			125.5800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9501		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2986 (36)
Total fabric heat loss						(33) + (36) =	43.2487 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.1907	24.0057	23.8244	22.9728	22.8134	22.0717	22.0717	21.9343	22.3574	22.8134	23.1358	23.4727 (38)
Heat transfer coeff	67.4394	67.2544	67.0731	66.2215	66.0621	65.3204	65.3204	65.1830	65.6061	66.0621	66.3845	66.7215 (39)
Average = Sum(39)m / 12 =												66.2207 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3289	1.3252	1.3216	1.3049	1.3017	1.2871	1.2871	1.2844	1.2927	1.3017	1.3081	1.3147 (40)
HLP (average)												1.3048 (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	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (46)
Water storage loss:												200.0000 (47)
Store volume												1.6525 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8924 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	173.0505	152.8086	161.1453	145.3751	143.1284	128.8469	124.6535	135.5293	134.8970	150.7006	158.1950	169.1971 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	173.0505	152.8086	161.1453	145.3751	143.1284	128.8469	124.6535	135.5293	134.8970	150.7006	158.1950	169.1971 (64)
Heat gains from water heating, kWh/month	81.3472	72.3128	77.3887	71.3772	71.3981	65.8815	65.2552	68.8714	67.8932	73.9159	75.6398	80.0660 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3325	11.8418	9.6304	7.2908	5.4500	4.6011	4.9717	6.4623	8.6737	11.0133	12.8542	13.7030	(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	323.5348	321.8628	312.1592	296.6327	281.1388	265.9740	255.9688	260.7719	268.6113	284.3089	302.3389	315.6010	(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				2.1500	36.7938	0.6300	0.7000	0.7700	24.1760 (79)			
Solar gains	105.9725	182.6179	255.4635	325.9144	373.6154	374.6807	359.6645	323.5015	279.7711	203.3410	127.3144	90.4421 (83)
Total gains	429.5074	504.4807	567.6227	622.5471	654.7543	640.6548	615.6333	584.2734	548.3824	487.6498	429.6534	406.0430 (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	52.2589	52.4026	52.5443	53.2200	53.3483	53.9541	53.9541	54.0678	53.7192	53.3483	53.0893	52.8212	
alpha	4.4839	4.4935	4.5030	4.5480	4.5566	4.5969	4.5969	4.6045	4.5813	4.5566	4.5393	4.5214	
util living area	0.9918	0.9825	0.9611	0.9061	0.7930	0.6175	0.4592	0.5013	0.7344	0.9285	0.9831	0.9935	(86)
MIT	19.7450	19.9470	20.2338	20.5731	20.8286	20.9594	20.9915	20.9875	20.9099	20.5781	20.1000	19.7109	(87)
Th 2	19.8183	19.8211	19.8239	19.8370	19.8395	19.8510	19.8510	19.8531	19.8465	19.8395	19.8345	19.8293	(88)
util rest of house	0.9890	0.9769	0.9485	0.8758	0.7313	0.5209	0.3432	0.3823	0.6434	0.8986	0.9767	0.9914	(89)
MIT 2	18.1863	18.4797	18.8901	19.3651	19.6841	19.8264	19.8482	19.8485	19.7827	19.3853	18.7129	18.1445	(90)
Living area fraction	18.8377	19.0929	19.4517	19.8699	20.1625	20.2999	20.3260	20.3245	20.2538	19.8838	19.2926	18.7991	(91)
Temperature adjustment	18.8377	19.0929	19.4517	19.8699	20.1625	20.2999	20.3260	20.3245	20.2538	19.8838	19.2926	18.7991	(92)
adjusted MIT	18.8377	19.0929	19.4517	19.8699	20.1625	20.2999	20.3260	20.3245	20.2538	19.8838	19.2926	18.7991	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	423.4797	490.5131	535.5917	545.8371	490.9905	358.8064	241.3083	252.5737	371.7558	438.8499	417.9274	401.4763	(94)
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	980.4144	954.5383	868.7100	726.4446	559.0478	372.3201	243.3857	255.8130	403.7284	613.3097	809.3988	974.0743	(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	414.3595	311.8250	247.8400	130.0374	50.6346	0.0000	0.0000	0.0000	0.0000	129.7981	281.8594	426.0129	(98)
Space heating												1992.3668	(98)
Space heating per m2												39.2585	(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													2130.8736 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.3595	311.8250	247.8400	130.0374	50.6346	0.0000	0.0000	0.0000	0.0000	129.7981	281.8594	426.0129	(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)	443.1652	333.5026	265.0695	139.0774	54.1547	0.0000	0.0000	0.0000	0.0000	138.8215	301.4539	455.6288	(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	87.0610	86.6777	85.9587	84.5181	82.3442	79.8000	79.8000	79.8000	79.8000	84.4186	86.3383	87.1772	(216)
Fuel for water heating, kWh/month	198.7693	176.2951	187.4683	172.0046	173.8173	161.4623	156.2073	169.8362	169.0438	178.5158	183.2269	194.0841	(219)
Water heating fuel used												2120.7312	(219)
Annual totals kWh/year													
Space heating fuel - main system												2130.8736	(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)												235.4560	(232)
Total delivered energy for all uses												4562.0608	(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	2130.8736	0.2160	460.2687 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2120.7312	0.2160	458.0779 (264)
Space and water heating			918.3466 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	235.4560	0.5190	122.2016 (268)
Total CO2, kg/m2/year			1079.4733 (272)
Emissions per m2 for space and water heating			18.0955 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4079 (272b)
Emissions per m2 for pumps and fans			0.7670 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.0955 * 1.55) + 2.4079 + 0.7670, rounded to 2 d.p.			31.2200 (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 2.3200 (2b)	= 117.7400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.7400 (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) = 0.1699 (8)
Pressure test					Yes
Measured/design AP50					4.0100
Infiltration rate					0.3704 (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) =				0.3426 (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	0.4368	0.4282	0.4197	0.3768	0.3683	0.3255	0.3255	0.3169	0.3426	0.3683	0.3854	0.4025 (22b)
	0.5954	0.5917	0.5881	0.5710	0.5678	0.5530	0.5530	0.5502	0.5587	0.5678	0.5743	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.9000	1.1450	7.9008		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Slab on ground			50.7500	0.1100	5.5825	110.0000	5582.5000 (28a)
100mm Knauf Supafil 34	56.5200	10.7000	45.8200	0.2600	11.9132	52.8000	2419.2960 (29a)
E-WM-30 WTS	18.3100	1.9800	16.3300	0.1900	3.1027	52.8000	862.2240 (29a)
Total net area of external elements Aum(A, m ²)			125.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5170		(33)
E-FC-4			50.7500			30.0000	1522.5000 (32b)
Timber partition			111.6800			9.0000	1005.1200 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11391.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							224.4658 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9957 (36)
Total fabric heat loss						(33) + (36) =	43.5128 (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	23.1337	22.9898	22.8487	22.1860	22.0620	21.4849	21.4849	21.3780	21.7072	22.0620	22.3128	22.5751 (38)
Heat transfer coeff	66.6465	66.5025	66.3614	65.6988	65.5748	64.9977	64.9977	64.8908	65.2200	65.5748	65.8256	66.0878 (39)
Average = Sum(39)m / 12 =												65.6982 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3132	1.3104	1.3076	1.2946	1.2921	1.2807	1.2807	1.2786	1.2851	1.2921	1.2971	1.3022 (40)
HLP (average)												1.2945 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)										Total = Sum(45)m =		1177.9137 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	25.9514	22.6973	23.4216	20.4195	19.5930	16.9073	15.6671	17.9782	18.1929	21.2021	23.1437	25.1326 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3325	11.8418	9.6304	7.2908	5.4500	4.6011	4.9717	6.4623	8.6737	11.0133	12.8542	13.7030	(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	246.0781	245.0303	236.6227	222.8582	208.5083	194.9542	186.3180	189.3670	196.5831	210.4570	226.4278	238.7658	(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	2.1500	36.7938	0.4600	0.0000	0.7700	28.0196	(79)
Southeast	3.8000	36.7938	0.4300	0.0000	0.7700	46.2933	(77)

Solar gains	119.5905	206.1494	288.5503	368.4022	422.5668	423.8770	406.8458	365.7691	316.0992	229.5882	143.6867	102.0567	(83)
Total gains	365.6686	451.1796	525.1730	591.2604	631.0751	618.8313	593.1638	555.1361	512.6823	440.0452	370.1144	340.8225	(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	47.4796	47.5823	47.6835	48.1644	48.2555	48.6840	48.6840	48.7642	48.5180	48.2555	48.0716	47.8809	
alpha	4.1653	4.1722	4.1789	4.2110	4.2170	4.2456	4.2456	4.2509	4.2345	4.2170	4.2048	4.1921	
util living area	0.9935	0.9841	0.9622	0.9063	0.7942	0.6256	0.4706	0.5192	0.7529	0.9378	0.9866	0.9951	(86)
MIT	19.5380	19.7773	20.1080	20.4929	20.7873	20.9434	20.9866	20.9798	20.8745	20.4727	19.9245	19.4931	(87)
Th 2	19.8305	19.8327	19.8349	19.8451	19.8470	19.8559	19.8559	19.8576	19.8525	19.8470	19.8431	19.8391	(88)
util rest of house	0.9915	0.9794	0.9508	0.8781	0.7357	0.5313	0.3539	0.3990	0.6668	0.9126	0.9818	0.9936	(89)
MIT 2	18.5191	18.7573	19.0821	19.4538	19.7101	19.8307	19.8526	19.8520	19.7872	19.4461	18.9131	18.4811	(90)
Living area fraction									fLA = Living area / (4) =			0.4179	(91)
MIT	18.9449	19.1836	19.5109	19.8881	20.1603	20.2957	20.3265	20.3233	20.2416	19.8751	19.3358	18.9040	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9449	19.1836	19.5109	19.8881	20.1603	20.2957	20.3265	20.3233	20.2416	19.8751	19.3358	18.9040	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9895	0.9760	0.9469	0.8793	0.7530	0.5691	0.4029	0.4494	0.6984	0.9134	0.9791	0.9919	(94)
Ext temp.	361.8142	440.3428	497.2852	519.8728	475.1914	352.2012	238.9873	249.4905	358.0778	401.9230	362.3725	338.0725	(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	976.0329	949.8923	863.4203	721.9058	554.7824	370.2103	242.2144	254.5892	400.5542	608.2144	805.4306	971.7582	(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	456.9787	342.4173	272.4045	145.4638	59.2157	0.0000	0.0000	0.0000	0.0000	153.4808	319.0018	471.4622	(98)
												2220.4248	(98)
												43.7522	(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	610.9780	480.9827	493.1699	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8965	0.9414	0.9249	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.7396	452.7824	456.1403	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	788.0549	756.8258	713.3366	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	173.0270	226.2083	191.3541	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												590.5893 (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	43.2567	56.5521	47.8385	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												147.6473 (107)
Space cooling per m2												2.9093 (108)
Energy for space heating												43.7522 (99)
Energy for space cooling												2.9093 (108)
Total												46.6615 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.7 (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 2.3200 (2b)	= 117.7400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.7400 (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) = 0.1699 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4199 (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) =	0.3884 (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	0.4952	0.4855	0.4758	0.4272	0.4175	0.3690	0.3690	0.3592	0.3884	0.4175	0.4369	0.4563 (22b)
Effective ac	0.6226	0.6178	0.6132	0.5913	0.5872	0.5681	0.5681	0.5645	0.5754	0.5872	0.5955	0.6041 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Opening Type (Uw = 1.40)			10.7000	1.3258	14.1856		(27)
Slab on ground			50.7500	0.1300	6.5975		(28a)
100mm Knauf Supafil 34	56.5200	10.7000	45.8200	0.1800	8.2476		(29a)
E-WM-30 WTS	18.3100	1.9800	16.3300	0.1800	2.9394		(29a)
Total net area of external elements Aum, m ²			125.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9501		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2986 (36)
Total fabric heat loss						(33) + (36) =	43.2487 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.1907	24.0057	23.8244	22.9728	22.8134	22.0717	22.0717	21.9343	22.3574	22.8134	23.1358	23.4727 (38)
Heat transfer coeff	67.4394	67.2544	67.0731	66.2215	66.0621	65.3204	65.3204	65.1830	65.6061	66.0621	66.3845	66.7215 (39)
Average = Sum(39)m / 12 =												66.2207 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3289	1.3252	1.3216	1.3049	1.3017	1.2871	1.2871	1.2844	1.2927	1.3017	1.3081	1.3147 (40)
HLP (average)												1.3048 (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	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	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	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

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

Metabolic gains (Table 5), Watts												
(66)m	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3325	11.8418	9.6304	7.2908	5.4500	4.6011	4.9717	6.4623	8.6737	11.0133	12.8542	13.7030 (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	246.0781	245.0303	236.6227	222.8582	208.5083	194.9542	186.3180	189.3670	196.5831	210.4570	226.4278	238.7658 (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	2.1500	36.7938	0.6300	0.7000	0.7700	24.1760 (79)

Solar gains	105.9725	182.6179	255.4635	325.9144	373.6154	374.6807	359.6645	323.5015	279.7711	203.3410	127.3144	90.4421 (83)
Total gains	352.0507	427.6481	492.0862	548.7726	582.1237	569.6349	545.9826	512.8685	476.3543	413.7979	353.7422	329.2078 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.2589	52.4026	52.5443	53.2200	53.3483	53.9541	53.9541	54.0678	53.7192	53.3483	53.0893	52.8212
alpha	4.4839	4.4935	4.5030	4.5480	4.5566	4.5969	4.5969	4.6045	4.5813	4.5566	4.5393	4.5214
util living area	0.9963	0.9906	0.9765	0.9358	0.8414	0.6767	0.5130	0.5631	0.7993	0.9580	0.9920	0.9972 (86)
MIT	19.6102	19.8179	20.1170	20.4821	20.7757	20.9411	20.9868	20.9800	20.8703	20.4767	19.9714	19.5759 (87)
Th 2	19.8183	19.8211	19.8239	19.8370	19.8395	19.8510	19.8510	19.8531	19.8465	19.8395	19.8345	19.8293 (88)
util rest of house	0.9950	0.9875	0.9682	0.9127	0.7860	0.5774	0.3858	0.4333	0.7139	0.9381	0.9888	0.9963 (89)
MIT 2	18.5705	18.7788	19.0752	19.4349	19.6952	19.8255	19.8479	19.8479	19.7799	19.4393	18.9430	18.5450 (90)
Living area fraction									fLA = Living area / (4) =			0.4179 (91)
MIT	19.0050	19.2131	19.5106	19.8726	20.1468	20.2918	20.3239	20.3210	20.2356	19.8729	19.3728	18.9759 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0050	19.2131	19.5106	19.8726	20.1468	20.2918	20.3239	20.3210	20.2356	19.8729	19.3728	18.9759 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9938	0.9853	0.9655	0.9135	0.8023	0.6176	0.4394	0.4880	0.7457	0.9388	0.9870	0.9953 (94)
Ext temp.	349.8583	421.3724	475.0940	501.3039	467.0169	351.7892	239.9289	250.2876	355.1954	388.4597	349.1612	327.6653 (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	991.6952	962.6180	872.6623	726.6205	558.0105	371.7897	243.2440	255.5850	402.5324	612.5849	814.7251	985.8670 (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	477.5266	363.7170	295.7908	162.2280	67.6993	0.0000	0.0000	0.0000	0.0000	166.7491	335.2060	489.7021 (98)
										(98) / (4) =		2358.6190 (98)
												46.4753 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8846	0.9360	0.9182	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	543.1669	452.4145	454.8891	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	730.5527	701.6789	663.9330	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.9177	185.4527	155.5286	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												475.8991 (104)
Cooled fraction												fC = cooled area / (4) = 1.0000 (105)

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	33.7294	46.3632	38.8822	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											118.9748 (107)
Space cooling per m2											2.3443 (108)
Energy for space heating											46.4753 (99)
Energy for space cooling											2.3443 (108)
Total											48.8196 (109)
Target Fabric Energy Efficiency (TFEE)											56.1 (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 2.3200 (2b)	= 117.7400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.7400 (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:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.9000	1.1450	7.9008		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Slab on ground			50.7500	0.1100	5.5825	110.0000	5582.5000 (28a)
100mm Knauf Supafil 34	56.5200	10.7000	45.8200	0.2600	11.9132	52.8000	2419.2960 (29a)
E-WM-30 WTS	18.3100	1.9800	16.3300	0.1900	3.1027	52.8000	862.2240 (29a)
Total net area of external elements Aum(A, m ²)			125.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5170		(33)
E-FC-4			50.7500			70.0000	3552.5000 (32b)
Timber partition			111.6800			9.0000	1005.1200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13421.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							264.4658 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9957 (36)
Total fabric heat loss						(33) + (36) =	43.5128 (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	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271 (38)
Heat transfer coeff	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399 (39)
Average = Sum(39)m / 12 =												62.9399 (39)
HLP	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402 (40)
HLP (average)												1.2402 (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 content (annual)	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)
	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	33.3312	29.6045	24.0760	18.2271	13.6250	11.5028	12.4291	16.1559	21.6844	27.5333	32.1354	34.2576 (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	444.8916	441.7460	426.8039	403.6776	380.2591	358.9681	346.2766	352.5534	365.6312	388.9286	414.8833	434.2716 (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			2.1500		40.4699		0.4600		0.0000		0.7700		30.8191 (79)
Southeast			3.8000		40.4699		0.4300		0.0000		0.7700		50.9184 (77)
Solar gains	131.8734	204.6766	283.7874	375.4269	421.6053	453.5619	430.2352	393.9624	337.6354	243.5628	162.3344	111.4520	(83)
Total gains	576.7650	646.4226	710.5914	779.1046	801.8644	812.5300	776.5118	746.5158	703.2667	632.4913	577.2177	545.7235	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348
alpha	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490
util living area	0.9712	0.9507	0.8990	0.7836	0.6030	0.3851	0.2511	0.2695	0.5092	0.8030	0.9401	0.9768 (86)
Tweekday	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627
Tweekend	20.5038	20.6005	20.7554	20.9007	20.9775	20.9980	20.9998	20.9997	20.9921	20.9057	20.6896	20.4732
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	20.2341	20.3820	20.6226	20.8450	20.9653	20.9969	20.9997	20.9996	20.9877	20.8544	20.5153	20.1870 (87)
Th 2	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880 (88)
util rest of house	0.9622	0.9362	0.8709	0.7321	0.5285	0.3006	0.1611	0.1760	0.4162	0.7431	0.9195	0.9693 (89)
Tweekday	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627
Tweekend	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627
MIT 2	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627 (90)
Living area fraction									fLA = Living area / (4) =			0.4179 (91)
MIT	19.4745	19.6576	19.9468	20.2015	20.3237	20.3508	20.3526	20.3525	20.3441	20.2152	19.8272	19.4161 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4745	19.6576	19.9468	20.2015	20.3237	20.3508	20.3526	20.3525	20.3441	20.2152	19.8272	19.4161 (93)

8. Space heating requirement

Utilisation	0.9581	0.9326	0.8726	0.7476	0.5585	0.3360	0.1987	0.2151	0.4550	0.7621	0.9182	0.9653 (94)
Useful gains	552.5777	602.8541	620.0507	582.4240	447.8126	273.0017	154.3243	160.5932	319.9734	482.0311	530.0067	526.7724 (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	904.7282	884.7824	789.6909	648.3720	460.9551	273.8374	154.3660	160.6562	323.7702	542.2374	744.4016	901.0563 (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	261.9999	189.4558	126.2123	47.4826	9.7780	0.0000	0.0000	0.0000	0.0000	44.7935	154.3643	278.4672 (98)
Space heating												1112.5537 (98)
RHI space heating demand												1113 (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 2.3200 (2b)	= 117.7400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.7400 (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:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			6.9000	1.1450	7.9008		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Slab on ground			50.7500	0.1100	5.5825	110.0000	5582.5000 (28a)
100mm Knauf Supafil 34	56.5200	10.7000	45.8200	0.2600	11.9132	52.8000	2419.2960 (29a)
E-WM-30 WTS	18.3100	1.9800	16.3300	0.1900	3.1027	52.8000	862.2240 (29a)
Total net area of external elements Aum(A, m ²)					125.5800		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5170		(33)
E-FC-4				50.7500		70.0000	3552.5000 (32b)
Timber partition				111.6800		9.0000	1005.1200 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			13421.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							264.4658 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9957 (36)
Total fabric heat loss				(33) + (36) =			43.5128 (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	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271 (38)
Heat transfer coeff	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399 (39)
Average = Sum(39)m / 12 =												62.9399 (39)
HLP	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402 (40)
HLP (average)												1.2402 (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	33.3312	29.6045	24.0760	18.2271	13.6250	11.5028	12.4291	16.1559	21.6844	27.5333	32.1354	34.2576 (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	444.8916	441.7460	426.8039	403.6776	380.2591	358.9681	346.2766	352.5534	365.6312	388.9286	414.8833	434.2716 (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				2.1500	36.7938	0.4600	0.0000	0.7700	28.0196 (79)			
Southeast				3.8000	36.7938	0.4300	0.0000	0.7700	46.2933 (77)			
Solar gains	119.5905	206.1494	288.5503	368.4022	422.5668	423.8770	406.8458	365.7691	316.0992	229.5882	143.6867	102.0567 (83)
Total gains	564.4821	647.8954	715.3542	772.0798	802.8259	782.8451	753.1224	718.3224	681.7304	618.5168	558.5700	536.3283 (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)												
tau	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348
alpha	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490
util living area	0.9781	0.9576	0.9154	0.8262	0.6803	0.5050	0.3661	0.4004	0.6104	0.8546	0.9578	0.9826 (86)
Tweekday	18.7836	19.0437	19.3662	19.6660	19.8314	19.8809	19.8873	19.8869	19.8680	19.6709	19.1787	18.7056
Tweekend	20.4380	20.5575	20.7096	20.8607	20.9559	20.9916	20.9986	20.9978	20.9795	20.8581	20.6172	20.4026
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	20.1327	20.3155	20.5518	20.7824	20.9319	20.9871	20.9978	20.9966	20.9681	20.7810	20.4023	20.0780 (87)
Th 2	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880 (88)
util rest of house	0.9714	0.9454	0.8921	0.7830	0.6143	0.4216	0.2744	0.3050	0.5229	0.8076	0.9434	0.9771 (89)
Tweekday	18.7836	19.0437	19.3662	19.6660	19.8314	19.8809	19.8873	19.8869	19.8680	19.6709	19.1787	18.7056
Tweekend	18.7836	19.0437	19.3662	19.6660	19.8314	19.8809	19.8873	19.8869	19.8680	19.6709	19.1787	18.7056
MIT 2	18.7836	19.0437	19.3662	19.6660	19.8314	19.8809	19.8873	19.8869	19.8680	19.6709	19.1787	18.7056 (90)
Living area fraction									fLA = Living area / (4) =			0.4179 (91)
MIT	19.3474	19.5752	19.8617	20.1326	20.2913	20.3432	20.3515	20.3507	20.3278	20.1348	19.6901	19.2792 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3474	19.5752	19.8617	20.1326	20.2913	20.3432	20.3515	20.3507	20.3278	20.1348	19.6901	19.2792 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9673	0.9413	0.8915	0.7933	0.6392	0.4563	0.3128	0.3450	0.5586	0.8191	0.9403	0.9733 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Useful gains	546.0215	609.8320	637.7227	612.4665	513.1404	357.1848	235.5945	247.8007	380.7902	506.6273	525.2006	522.0094 (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	947.0839	923.6578	840.9855	706.9761	540.7384	361.4763	236.1159	248.6553	391.9746	600.1206	792.4204	949.0818 (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	298.3904	210.8909	151.2275	68.0469	20.5329	0.0000	0.0000	0.0000	0.0000	69.5590	192.3982	317.7418 (98)
Space heating per m2												1328.7876 (98)
											(98) / (4) =	26.1830 (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 %)												195.2148 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												680.6797 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	298.3904	210.8909	151.2275	68.0469	20.5329	0.0000	0.0000	0.0000	0.0000	69.5590	192.3982	317.7418 (98)
Space heating efficiency (main heating system 1)	195.2148	195.2148	195.2148	195.2148	195.2148	0.0000	0.0000	0.0000	0.0000	195.2148	195.2148	195.2148 (210)
Space heating fuel (main heating system)	152.8523	108.0302	77.4672	34.8574	10.5181	0.0000	0.0000	0.0000	0.0000	35.6320	98.5572	162.7652 (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												680.6797 (211)
Space heating fuel - main system												0.0000 (215)
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)												32.4564 (230a)
Total electricity for the above, kWh/year												32.4564 (231)
Electricity for lighting (calculated in Appendix L)												235.4560 (232)
Total delivered energy for all uses												1787.8327 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	680.6797	13.1900	89.7817 (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	32.4564	13.1900	4.2810 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	235.4560	13.1900	31.0566 (250)
Additional standing charges			0.0000 (251)
Total energy cost			235.8151 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0344 (257)
SAP value		85.5703
SAP rating (Section 12)		86 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	680.6797	0.5190	353.2728 (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			788.8386 (265)
Pumps and fans	32.4564	0.5190	16.8449 (267)
Energy for lighting	235.4560	0.5190	122.2016 (268)
Total kg/year			927.8852 (272)
CO2 emissions per m2			18.2800 (273)
EI value			87.0145
EI rating			87 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.9521 = 6.757$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.9521 = 0.2659$, 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 2.3200 (2b)	= 117.7400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.7400 (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)			6.9000	1.1450	7.9008		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
Slab on ground			50.7500	0.1100	5.5825	110.0000	5582.5000 (28a)
100mm Knauf Supafil 34	56.5200	10.7000	45.8200	0.2600	11.9132	52.8000	2419.2960 (29a)
E-WM-30 WTS	18.3100	1.9800	16.3300	0.1900	3.1027	52.8000	862.2240 (29a)
Total net area of external elements Aum(A, m ²)					125.5800		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5170		(33)
E-FC-4					50.7500	70.0000	3552.5000 (32b)
Timber partition					111.6800	9.0000	1005.1200 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			13421.6400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							264.4658 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9957 (36)
Total fabric heat loss				(33) + (36) =			43.5128 (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	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271	19.4271 (38)
Heat transfer coeff	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399	62.9399 (39)
Average = Sum(39)m / 12 =												62.9399 (39)
HLP	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402	1.2402 (40)
HLP (average)												1.2402 (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	33.3312	29.6045	24.0760	18.2271	13.6250	11.5028	12.4291	16.1559	21.6844	27.5333	32.1354	34.2576 (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	444.8916	441.7460	426.8039	403.6776	380.2591	358.9681	346.2766	352.5534	365.6312	388.9286	414.8833	434.2716 (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				2.1500	40.4699	0.4600	0.0000	0.7700	30.8191 (79)			
Southeast				3.8000	40.4699	0.4300	0.0000	0.7700	50.9184 (77)			

Solar gains	131.8734	204.6766	283.7874	375.4269	421.6053	453.5619	430.2352	393.9624	337.6354	243.5628	162.3344	111.4520 (83)
Total gains	576.7650	646.4226	710.5914	779.1046	801.8644	812.5300	776.5118	746.5158	703.2667	632.4913	577.2177	545.7235 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348	59.2348
alpha	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490	4.9490
util living area	0.9712	0.9507	0.8990	0.7836	0.6030	0.3851	0.2511	0.2695	0.5092	0.8030	0.9401	0.9768 (86)
Tweekday	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627
Tweekend	20.5038	20.6005	20.7554	20.9007	20.9775	20.9980	20.9998	20.9997	20.9921	20.9057	20.6896	20.4732
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	20.2341	20.3820	20.6226	20.8450	20.9653	20.9969	20.9997	20.9996	20.9877	20.8544	20.5153	20.1870 (87)
Th 2	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880	19.8880 (88)
util rest of house	0.9622	0.9362	0.8709	0.7321	0.5285	0.3006	0.1611	0.1760	0.4162	0.7431	0.9195	0.9693 (89)
Tweekday	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627
Tweekend	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627
MIT 2	18.9290	19.1374	19.4615	19.7394	19.8631	19.8868	19.8879	19.8879	19.8820	19.7562	19.3331	18.8627 (90)
Living area fraction									fLA = Living area / (4) =			0.4179 (91)
MIT	19.4745	19.6576	19.9468	20.2015	20.3237	20.3508	20.3526	20.3525	20.3441	20.2152	19.8272	19.4161 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4745	19.6576	19.9468	20.2015	20.3237	20.3508	20.3526	20.3525	20.3441	20.2152	19.8272	19.4161 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9581	0.9326	0.8726	0.7476	0.5585	0.3360	0.1987	0.2151	0.4550	0.7621	0.9182	0.9653 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Useful gains	552.5777	602.8541	620.0507	582.4240	447.8126	273.0017	154.3243	160.5932	319.9734	482.0311	530.0067	526.7724 (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	904.7282	884.7824	789.6909	648.3720	460.9551	273.8374	154.3660	160.6562	323.7702	542.2374	744.4016	901.0563 (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	261.9999	189.4558	126.2123	47.4826	9.7780	0.0000	0.0000	0.0000	0.0000	44.7935	154.3643	278.4672 (98)
Space heating per m2										(98) / (4) =		21.9222 (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 %)												195.2148 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												569.9126 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	261.9999	189.4558	126.2123	47.4826	9.7780	0.0000	0.0000	0.0000	0.0000	44.7935	154.3643	278.4672 (98)
Space heating efficiency (main heating system 1)	195.2148	195.2148	195.2148	195.2148	195.2148	0.0000	0.0000	0.0000	0.0000	195.2148	195.2148	195.2148 (210)
Space heating fuel (main heating system)	134.2111	97.0499	64.6530	24.3232	5.0089	0.0000	0.0000	0.0000	0.0000	22.9457	79.0741	142.6466 (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												569.9126 (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)												32.4564 (230a)
Total electricity for the above, kWh/year												32.4564 (231)
Electricity for lighting (calculated in Appendix L)												235.4560 (232)
Total delivered energy for all uses												1677.0655 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	569.9126	16.9600	96.6572 (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	32.4564	16.9600	5.5046 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	235.4560	16.9600	39.9333 (250)
Additional standing charges			0.0000 (251)
Total energy cost			284.4303 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	569.9126	0.5190	295.7846 (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			731.3505 (265)
Pumps and fans	32.4564	0.5190	16.8449 (267)
Energy for lighting	235.4560	0.5190	122.2016 (268)
Total kg/year			870.3970 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	569.9126	3.0700	1749.6316 (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			4326.1001 (265)
Pumps and fans	32.4564	3.0700	99.6412 (267)
Energy for lighting	235.4560	3.0700	722.8498 (268)
Primary energy kWh/year			5148.5912 (272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Primary energy kWh/m²/year

101.4501 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
Current environmental impact rating: B 87

(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 Environmental
(none) efficiency impact

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 86
Potential environmental impact rating: B 87

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

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

	Current	Potential	Saving
Electricity	£284	£284	£0
Space heating	£102	£102	£0
Water heating	£142	£142	£0
Lighting	£40	£40	£0
Total cost of fuels	£284	£284	£0
Total cost of uses	£284	£284	£0
Delivered energy	33 kWh/m ²	33 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m ²	17 kg/m ²	17 kg/m ²	0 kg/m ²
Primary energy	101 kWh/m ²	101 kWh/m ²	0 kWh/m ²

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	264.5 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	116.56 (P1)
Transmission heat loss coefficient	43.51 (37)
Summer heat loss coefficient	160.08 (P2)

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

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
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	2.1500	119.9223	0.4600	0.0000	0.9000	106.7429
South East	3.8000	119.9223	0.4300	0.0000	0.9000	176.3578
total:						502.8723

Solar gains	Jun	Jul	Aug	
	530	503	460	(P3/P4)
Internal gains	359	346	353	
Total summer gains	889	849	813	(P5)
Summer gain/loss ratio	5.55	5.30	5.08	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 264.5)	0.15	0.15	0.15	
Threshold temperature	21.70	23.35	23.03	(P7)
Likelihood of high internal temperature	Slight	Medium	Medium	
Assessment of likelihood of high internal temperature:	Medium			