

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat 1			Issued on Date	21/06/2023
Assessment Reference	001	Prop Type Ref	1		
Property	Birchwood House , Flat 1, Northwood, HA6 2UZ				
SAP Rating	83 B	DER	10.53	TER	24.48
Environmental	91 B	% DER<TER	56.98		
CO ₂ Emissions (t/year)	1.21	DFEE	53.78	TFEE	60.59
General Requirements Compliance	Pass	% DFEE<TFEE	11.23		
Assessor Details	Mr. Zahid Ashraf, Wires & Wireless Ltd, Tel: 01793 273 981, zahid_153@yahoo.com			Assessor ID	Q076-0001
Client	Westcombe Group, Birchwood House				

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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 148 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 (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.48 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.53 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)60.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)53.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.40 (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:	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 0.50 kWh/day

Permitted by DBSCG 0.50 OK

Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.79	
Maximum	1.5	OK
MVHR efficiency:	92%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average

Windows facing North: 16.28 m², No overhang

Windows facing West: 6.60 m², No overhang

Air change rate: 0.00 ach

Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Roof U-value 0.10 W/m²K

Floor U-value 0.12 W/m²K

Photovoltaic array 1.35 kW

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	147.7900 (1b)	x 2.5000 (2b)	= 369.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.4750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.2500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												78.2000 (23c)
Effective ac	0.3799	0.3746	0.3693	0.3428	0.3374	0.3109	0.3109	0.3056	0.3215	0.3374	0.3481	0.3587 (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
N Window (Uw = 1.40)			22.8800	1.3258	30.3333		(27)
Floor			147.7900	0.1200	17.7348		(28a)
External Wall	72.9740	22.8800	50.0940	0.1800	9.0169		(29a)
Parking Wall	41.3000		41.3000	0.2700	11.1510		(29a)
Flat Roof	28.5130		28.5130	0.1000	2.8513		(30)
Total net area of external elements Aum(A, m ²)			290.5770				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		71.0874		(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)							30.4727 (36)
Total fabric heat loss						(33) + (36) =	101.5600 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.3245	45.6768	45.0291	41.7904	41.1427	37.9040	37.9040	37.2562	39.1995	41.1427	42.4381	43.7336 (38)
Average = Sum(39)m / 12 =	147.8846	147.2369	146.5891	143.3504	142.7027	139.4640	139.4640	138.8163	140.7595	142.7027	143.9982	145.2936 (39)
	147.8846	147.2369	146.5891	143.3504	142.7027	139.4640	139.4640	138.8163	140.7595	142.7027	143.9982	145.2936 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0006	0.9963	0.9919	0.9700	0.9656	0.9437	0.9437	0.9393	0.9524	0.9656	0.9743	0.9831 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9307 (42)
Average daily hot water use (litres/day)												103.8037 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.1840	110.0319	105.8797	101.7276	97.5755	93.4233	93.4233	97.5755	101.7276	105.8797	110.0319	114.1840 (44)
Energy content (annual)	169.3316	148.0985	152.8244	133.2360	127.8431	110.3189	102.2267	117.3066	118.7076	138.3423	151.0114	163.9886 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.3997	22.2148	22.9237	19.9854	19.1765	16.5478	15.3340	17.5960	17.8061	20.7513	22.6517	24.5983 (46)
Water storage loss:												

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Store volume												10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.5000 (48)
Temperature factor from Table 2b												1.0000 (49)
Enter (49) or (54) in (55)												0.5000 (55)
Total storage loss	15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	(56)
If cylinder contains dedicated solar storage	15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	(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	(59)
Total heat required for water heating calculated for each month	208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510 (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	208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510 (64)
Heat gains from water heating, kWh/month	87.3127	77.2517	81.8240	74.3106	73.5178	66.6906	65.0003	70.0144	69.4799	77.0087	80.2209	85.5361 (65)
Total per year (kWh/year) = Sum(64)m =												2089.6320 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	29.0466	25.7990	20.9811	15.8841	11.8735	10.0241	10.8314	14.0791	18.8969	23.9940	28.0045	29.8539 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	318.1084	321.4094	313.0910	295.3823	273.0281	252.0184	237.9826	234.6817	243.0000	260.7088	283.0629	304.0726 (68)
Pumps, fans	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272 (71)
Total internal gains	117.3558	114.9579	109.9785	103.2091	98.8142	92.6259	87.3660	94.1053	96.4998	103.5064	111.4179	114.9679 (72)
	531.4710	529.1265	511.0109	481.4357	450.6761	421.6286	403.1403	409.8263	425.3570	455.1693	489.4456	515.8547 (73)

6. Solar gains

[Jan]													
	Area				Solar flux		g		FF		Access		Gains
	m2				Table 6a		Table 6b		Table 6c		factor		W
					W/m2		or		or Table 6c		Table 6d		
North	16.2800				10.6334		0.5400		0.8000		0.7700		51.8255 (74)
West	6.6000				19.6403		0.5400		0.8000		0.7700		38.8068 (80)
Solar gains	90.6323	174.9555	293.3153	452.6596	587.6104	618.5849	581.7400	475.8255	347.7489	207.9744	112.3209	75.1171 (83)	
Total gains	622.1033	704.0820	804.3262	934.0952	1038.2865	1040.2136	984.8803	885.6519	773.1059	663.1437	601.7665	590.9718 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	69.4000	69.7053	70.0133	71.5951	71.9201	73.5903	73.5903	73.9336	72.9130	71.9201	71.2731	70.6376
util living area	5.6267	5.6470	5.6676	5.7730	5.7947	5.9060	5.9060	5.9289	5.8609	5.7947	5.7515	5.7092
MIT	0.9997	0.9993	0.9975	0.9868	0.9353	0.7825	0.6081	0.6887	0.9323	0.9948	0.9993	0.9998 (86)
MIT 2	19.7930	19.9102	20.1342	20.4660	20.7659	20.9481	20.9903	20.9811	20.8349	20.4579	20.0808	19.7875 (87)
Th 2	20.0828	20.0865	20.0901	20.1084	20.1121	20.1305	20.1305	20.1342	20.1232	20.1121	20.1048	20.0974 (88)
util rest of house	0.9996	0.9990	0.9965	0.9812	0.9071	0.7040	0.4957	0.5749	0.8906	0.9919	0.9990	0.9997 (89)
MIT 2	18.4446	18.6189	18.9491	19.4443	19.8630	20.0928	20.1265	20.1253	19.9693	19.4383	18.8822	18.4473 (90)
Living area fraction									fLA = Living area / (4) =			0.1460 (91)
MIT	18.6414	18.8073	19.1220	19.5934	19.9948	20.2176	20.2526	20.2502	20.0957	19.5871	19.0572	18.6429 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6414	18.8073	19.1220	19.5934	19.9948	20.2176	20.2526	20.2502	20.0957	19.5871	19.0572	18.6429 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9993	0.9984	0.9949	0.9768	0.9025	0.7126	0.5121	0.5911	0.8889	0.9893	0.9985	0.9995 (94)
Ext temp.	621.6606	702.9681	800.2630	912.4341	937.0627	741.2442	504.3443	523.5332	687.2263	656.0548	600.8394	590.6656 (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	2120.8746	2047.6739	1850.2524	1532.9072	1183.6906	783.4571	509.4073	534.4752	843.9480	1282.4847	1721.8090	2098.4647 (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	1115.4153	903.6423	781.1922	446.7406	183.4912	0.0000	0.0000	0.0000	0.0000	466.0638	807.0981	1121.8026 (98)
Space heating per m2												5825.4460 (98)
										(98) / (4) =		39.4171 (99)

8c. Space cooling requirement

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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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1310.9619	1032.0338	1055.0038	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8616	0.9264	0.8898	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1129.5230	956.0673	938.7370	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1330.9829	1263.7268	1149.8623	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	145.0511	228.8986	157.0773	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									FC = cooled area / (4) =			531.0270 (104)
Intermittency factor (Table 10b)												0.4032 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	14.6214	23.0734	15.8337	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												53.5285 (107)
												0.3622 (108)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	1.0000 (303a)
Fraction of total space heat from community Heat pump	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	5825.4460 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	6116.7183 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2089.6320 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2194.1136 (310a)
Electricity used for heat distribution	83.1083 (313)
Cooling System Energy Efficiency Ratio	6.7500 (314)
Space cooling (if there is a fixed cooling system, if not enter 0)	7.9301 (315)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9875)	
mechanical ventilation fans (SFP = 0.9875)	445.1250 (330a)
Total electricity for the above, kWh/year	445.1250 (331)
Electricity for lighting (calculated in Appendix L)	512.9727 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 1.35 * 951 * 0.80) =	-821.3322 (333)
Total delivered energy for all uses	8455.5275 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			300.0000 (367a)
Space heating from Heat pump	2770.2773	0.5190	1437.7739 (367)
Electrical energy for heat distribution	83.1083	0.5190	43.1332 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1480.9071 (373)
Space and water heating			1480.9071 (376)
Space cooling	7.9301	0.5190	4.1157 (377)
Pumps and fans	445.1250	0.5190	231.0199 (378)
Energy for lighting	512.9727	0.5190	266.2328 (379)
Energy saving/generation technologies			
PV Unit	-821.3322	0.5190	-426.2714 (380)
Total CO2, kg/year			1556.0042 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.5300 (384)

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

DER	10.5300 ZC1
Total Floor Area	TFA 147.7900
Assumed number of occupants	N 2.9307
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	12.7549 ZC2
CO2 emissions from cooking, equation (L16)	1.2811 ZC3
Total CO2 emissions	24.5660 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	24.5660 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	147.7900 (1b)	x 2.5000 (2b)	= 369.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.4750 (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				4 * 10 =	40.0000 (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					40.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3583 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3045 (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	0.3883	0.3807	0.3730	0.3350	0.3274	0.2893	0.2893	0.2817	0.3045	0.3274	0.3426	0.3578 (22b)
Effective ac	0.5754	0.5724	0.5696	0.5561	0.5536	0.5418	0.5418	0.5397	0.5464	0.5536	0.5587	0.5640 (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 Opening Type (Uw = 1.40)			22.8800	1.3258	30.3333		(27)
Floor			147.7900	0.1300	19.2127		(28a)
External Wall	72.9740	22.8800	50.0940	0.1800	9.0169		(29a)
Parking Wall	41.3000		41.3000	0.1800	7.4340		(29a)
Flat Roof	28.5130		28.5130	0.1300	3.7067		(30)
Total net area of external elements Aum(A, m ²)			290.5770				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.7036		(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)							29.4185 (36)
Total fabric heat loss						(33) + (36) =	99.1222 (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	70.1536	69.7968	69.4470	67.8040	67.4966	66.0655	66.0655	65.8005	66.6167	67.4966	68.1184	68.7686 (38)
Heat transfer coeff	169.2758	168.9189	168.5691	166.9261	166.6187	165.1877	165.1877	164.9227	165.7389	166.6187	167.2406	167.8907 (39)
Average = Sum(39)m / 12 =												166.9246 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1454	1.1430	1.1406	1.1295	1.1274	1.1177	1.1177	1.1159	1.1214	1.1274	1.1316	1.1360 (40)
HLP (average)												1.1295 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9307 (42)
Average daily hot water use (litres/day)												103.8037 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1840	110.0319	105.8797	101.7276	97.5755	93.4233	93.4233	97.5755	101.7276	105.8797	110.0319	114.1840 (44)
Energy conte	169.3316	148.0985	152.8244	133.2360	127.8431	110.3189	102.2267	117.3066	118.7076	138.3423	151.0114	163.9886 (45)
Energy content (annual)										Total = Sum(45)m =		1633.2360 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3997	22.2148	22.9237	19.9854	19.1765	16.5478	15.3340	17.5960	17.8061	20.7513	22.6517	24.5983 (46)
Water storage loss:												10.0000 (47)
Store volume												0.3712 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.2005 (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	6.2141	5.6127	6.2141	6.0136	6.2141	6.0136	6.2141	6.2141	6.0136	6.2141	6.0136	6.2141 (56)
If cylinder contains dedicated solar storage	6.2141	5.6127	6.2141	6.0136	6.2141	6.0136	6.2141	6.2141	6.0136	6.2141	6.0136	6.2141 (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	198.8081	174.7225	182.3009	161.7617	157.3196	138.8446	131.7032	146.7831	147.2333	167.8188	179.5371	193.4651 (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	198.8081	174.7225	182.3009	161.7617	157.3196	138.8446	131.7032	146.7831	147.2333	167.8188	179.5371	193.4651 (64)
Heat gains from water heating, kWh/month	79.8840	70.5419	74.3953	67.1215	66.0890	59.5016	57.5716	62.5857	62.2908	69.5800	73.0318	78.1074 (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	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.7834	26.4534	21.5133	16.2870	12.1747	10.2784	11.1062	14.4362	19.3763	24.6026	28.7149	30.6112	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.1084	321.4094	313.0910	295.3823	273.0281	252.0184	237.9826	234.6817	243.0000	260.7088	283.0629	304.0726	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	(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)	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	(71)
Water heating gains (Table 5)	107.3709	104.9731	99.9937	93.2243	88.8294	82.6411	77.3812	84.1205	86.5150	93.5215	101.4331	104.9831	(72)
Total internal gains	525.2230	522.7960	504.5583	474.8538	443.9924	414.8981	396.4302	403.1986	418.8515	448.7931	483.1711	509.6271	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				16.2800	10.6334	0.6300	0.7000	0.7700	52.9052 (74)			
West				6.6000	19.6403	0.6300	0.7000	0.7700	39.6153 (80)			
Solar gains	92.5205	178.6004	299.4260	462.0900	599.8523	631.4721	593.8596	485.7386	354.9937	212.3072	114.6610	76.6821 (83)
Total gains	617.7435	701.3965	803.9843	936.9437	1043.8447	1046.3702	990.2898	888.9372	773.8452	661.1003	597.8321	586.3092 (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	60.6300	60.7581	60.8842	61.4835	61.5969	62.1305	62.1305	62.2303	61.9239	61.5969	61.3678	61.1302	
alpha	5.0420	5.0505	5.0589	5.0989	5.1065	5.1420	5.1420	5.1487	5.1283	5.1065	5.0912	5.0753	
util living area	0.9996	0.9992	0.9976	0.9892	0.9523	0.8415	0.6872	0.7646	0.9520	0.9955	0.9993	0.9997	(86)
MIT	19.5948	19.7155	19.9546	20.3029	20.6456	20.8870	20.9704	20.9495	20.7401	20.3142	19.8987	19.5765	(87)
Th 2	19.9639	19.9659	19.9678	19.9768	19.9785	19.9864	19.9864	19.9878	19.9834	19.9785	19.9751	19.9715	(88)
util rest of house	0.9995	0.9989	0.9966	0.9843	0.9283	0.7626	0.5514	0.6358	0.9167	0.9928	0.9989	0.9996	(89)
MIT 2	18.0691	18.2472	18.5982	19.1110	19.5950	19.9005	19.9739	19.9630	19.7348	19.1315	18.5220	18.0476	(90)
Living area fraction									fLA = Living area / (4) =			0.1460	(91)
MIT	18.2918	18.4615	18.7962	19.2850	19.7484	20.0445	20.1194	20.1070	19.8815	19.3041	18.7229	18.2708	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2918	18.4615	18.7962	19.2850	19.7484	20.0445	20.1194	20.1070	19.8815	19.3041	18.7229	18.2708	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9992	0.9982	0.9949	0.9796	0.9213	0.7679	0.5708	0.6530	0.9119	0.9901	0.9983	0.9994	(94)
Useful gains	617.2224	700.1621	799.8848	917.8095	961.6858	803.5413	565.2237	580.4944	705.6804	654.5335	596.8083	585.9354	(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	2368.4762	2290.7878	2072.7572	1733.5258	1341.0064	899.3602	581.3553	611.3685	958.2189	1450.2725	1943.8208	2362.3514	(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	1302.9328	1068.9005	947.0171	587.3158	282.2145	0.0000	0.0000	0.0000	0.0000	592.0298	969.8490	1321.6535	(98)
Space heating												7071.9130	(98)
Space heating per m2												(98) / (4) =	47.8511 (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													7563.5433 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1302.9328	1068.9005	947.0171	587.3158	282.2145	0.0000	0.0000	0.0000	0.0000	592.0298	969.8490	1321.6535	(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)	1393.5110	1143.2091	1012.8525	628.1452	301.8337	0.0000	0.0000	0.0000	0.0000	633.1870	1037.2717	1413.5332	(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	198.8081	174.7225	182.3009	161.7617	157.3196	138.8446	131.7032	146.7831	147.2333	167.8188	179.5371	193.4651	(64)
Efficiency of water heater (217)m	88.9216	88.8267	88.5826	87.9533	86.3556	79.8000	79.8000	79.8000	79.8000	87.8970	88.6434	88.9766	(217)
Fuel for water heating, kWh/month	223.5770	196.7005	205.7976	183.9177	182.1765	173.9907	165.0416	183.9387	184.5029	190.9266	202.5386	217.4337	(219)
Water heating fuel used												2310.5420	(219)
Annual totals kWh/year													
Space heating fuel - main system												7563.5433	(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)												525.9850	(232)
Total delivered energy for all uses												10475.0704	(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	7563.5433	0.2160	1633.7254 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2310.5420	0.2160	499.0771 (264)
Space and water heating			2132.8024 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	525.9850	0.5190	272.9862 (268)
Total CO2, kg/m2/year			2444.7137 (272)
Emissions per m2 for space and water heating			14.4313 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.8471 (272b)
Emissions per m2 for pumps and fans			0.2634 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4313 * 1.55) + 1.8471 + 0.2634, rounded to 2 d.p.			24.4800 (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	147.7900 (1b)	x 2.5000 (2b)	= 369.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.4750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (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					40.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3583 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3045 (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	0.3883	0.3807	0.3730	0.3350	0.3274	0.2893	0.2893	0.2817	0.3045	0.3274	0.3426	0.3578 (22b)
Effective ac	0.5754	0.5724	0.5696	0.5561	0.5536	0.5418	0.5418	0.5397	0.5464	0.5536	0.5587	0.5640 (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
N Window (Uw = 1.40)			22.8800	1.3258	30.3333		(27)
Floor			147.7900	0.1200	17.7348		(28a)
External Wall	72.9740	22.8800	50.0940	0.1800	9.0169		(29a)
Parking Wall	41.3000		41.3000	0.2700	11.1510		(29a)
Flat Roof	28.5130		28.5130	0.1000	2.8513		(30)
Total net area of external elements Aum(A, m ²)			290.5770				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	71.0874	(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)							30.4727 (36)
Total fabric heat loss						(33) + (36) =	101.5600 (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	70.1536	69.7968	69.4470	67.8040	67.4966	66.0655	66.0655	65.8005	66.6167	67.4966	68.1184	68.7686 (38)
Heat transfer coeff	171.7137	171.3568	171.0070	169.3640	169.0566	167.6256	167.6256	167.3606	168.1768	169.0566	169.6785	170.3286 (39)
Average = Sum(39)m / 12 =												169.3625 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1619	1.1595	1.1571	1.1460	1.1439	1.1342	1.1342	1.1324	1.1379	1.1439	1.1481	1.1525 (40)
HLP (average)												1.1460 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9307 (42)
Average daily hot water use (litres/day)												103.8037 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1840	110.0319	105.8797	101.7276	97.5755	93.4233	93.4233	97.5755	101.7276	105.8797	110.0319	114.1840 (44)
Energy conte	169.3316	148.0985	152.8244	133.2360	127.8431	110.3189	102.2267	117.3066	118.7076	138.3423	151.0114	163.9886 (45)
Energy content (annual)												Total = Sum(45)m = 1633.2360 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF 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	35.9830	31.4709	32.4752	28.3127	27.1667	23.4428	21.7232	24.9277	25.2254	29.3977	32.0899	34.8476 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	29.0466	25.7990	20.9811	15.8841	11.8735	10.0241	10.8314	14.0791	18.8969	23.9940	28.0045	29.8539 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	318.1084	321.4094	313.0910	295.3823	273.0281	252.0184	237.9826	234.6817	243.0000	260.7088	283.0629	304.0726 (68)
Pumps, fans	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272 (71)
Total internal gains	48.3642	46.8318	43.6494	39.3231	36.5143	32.5594	29.1978	33.5049	35.0352	39.5131	44.5693	46.8382 (72)
	462.4794	461.0003	444.6818	417.5497	388.3762	361.5622	344.9721	349.2259	363.8924	391.1761	422.5970	447.7249 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					16.2800	10.6334	0.5400	0.8000	0.7700	51.8255 (74)		
West					6.6000	19.6403	0.5400	0.8000	0.7700	38.8068 (80)		

Solar gains	90.6323	174.9555	293.3153	452.6596	587.6104	618.5849	581.7400	475.8255	347.7489	207.9744	112.3209	75.1171 (83)
Total gains	553.1117	635.9558	737.9971	870.2092	975.9866	980.1471	926.7121	825.0514	711.6413	599.1504	534.9179	522.8420 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	59.7692	59.8937	60.0162	60.5984	60.7086	61.2269	61.2269	61.3238	61.0262	60.7086	60.4861	60.2553
util living area	4.9846	4.9929	5.0011	5.0399	5.0472	5.0818	5.0818	5.0883	5.0684	5.0472	5.0324	5.0170
	0.9998	0.9995	0.9984	0.9923	0.9638	0.8709	0.7280	0.8055	0.9658	0.9971	0.9996	0.9998 (86)
MIT	19.5323	19.6531	19.8939	20.2459	20.5982	20.8603	20.9599	20.9329	20.6987	20.2615	19.8406	19.5145 (87)
Th 2	19.9506	19.9526	19.9545	19.9635	19.9651	19.9730	19.9730	19.9744	19.9700	19.9651	19.9617	19.9582 (88)
util rest of house	0.9997	0.9993	0.9977	0.9887	0.9444	0.7983	0.5898	0.6799	0.9384	0.9954	0.9994	0.9998 (89)
MIT 2	18.5972	18.7194	18.9616	19.3190	19.6626	19.8977	19.9610	19.9507	19.7666	19.3373	18.9143	18.5853 (90)
Living area fraction									fLA = Living area / (4) =			0.1460 (91)
MIT	18.7336	18.8557	19.0976	19.4543	19.7991	20.0382	20.1068	20.0940	19.9026	19.4722	19.0495	18.7209 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7336	18.8557	19.0976	19.4543	19.7991	20.0382	20.1068	20.0940	19.9026	19.4722	19.0495	18.7209 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9996	0.9990	0.9969	0.9862	0.9403	0.8039	0.6098	0.6970	0.9359	0.9941	0.9991	0.9997 (94)
Ext temp.	552.8683	635.3288	735.7070	858.1883	917.7010	787.8939	565.1357	575.0984	666.0415	595.6324	534.4357	522.6725 (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	2478.4529	2391.4052	2154.2846	1787.5155	1369.2124	911.5763	587.8269	618.2328	975.8640	1499.9072	2027.5664	2473.3332 (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	1432.6350	1180.0833	1055.4218	669.1156	335.9245	0.0000	0.0000	0.0000	0.0000	672.7805	1075.0541	1451.2915 (98)
Space heating per m2												7872.3063 (98)
										(98) / (4) =		53.2668 (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	1575.6806	1240.4294	1271.9405	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7348	0.8234	0.7649	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1157.8771	1021.4129	972.9133	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1270.9164	1205.5586	1089.2619	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	81.3883	137.0044	86.5633	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												304.9560 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	20.3471	34.2511	21.6408	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												76.2390 (107)
Energy for space heating												0.5159 (108)
Energy for space cooling												53.2668 (99)
Total												0.5159 (108)
Dwelling Fabric Energy Efficiency (DFEE)												53.7827 (109)
												53.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	147.7900 (1b)	x 2.5000 (2b)	= 369.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.4750 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) = 0.1083 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3583 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3045 (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	0.3883	0.3807	0.3730	0.3350	0.3274	0.2893	0.2893	0.2817	0.3045	0.3274	0.3426	0.3578 (22b)
Effective ac	0.5754	0.5724	0.5696	0.5561	0.5536	0.5418	0.5418	0.5397	0.5464	0.5536	0.5587	0.5640 (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 Opening Type (Uw = 1.40)			22.8800	1.3258	30.3333		(27)
Floor			147.7900	0.1300	19.2127		(28a)
External Wall	72.9740	22.8800	50.0940	0.1800	9.0169		(29a)
Parking Wall	41.3000		41.3000	0.1800	7.4340		(29a)
Flat Roof	28.5130		28.5130	0.1300	3.7067		(30)
Total net area of external elements Aum(A, m ²)			290.5770				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.7036		(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)							29.4185 (36)
Total fabric heat loss						(33) + (36) =	99.1222 (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	70.1536	69.7968	69.4470	67.8040	67.4966	66.0655	66.0655	65.8005	66.6167	67.4966	68.1184	68.7686 (38)
Heat transfer coeff	169.2758	168.9189	168.5691	166.9261	166.6187	165.1877	165.1877	164.9227	165.7389	166.6187	167.2406	167.8907 (39)
Average = Sum(39)m / 12 =												166.9246 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1454	1.1430	1.1406	1.1295	1.1274	1.1177	1.1177	1.1159	1.1214	1.1274	1.1316	1.1360 (40)
HLP (average)												1.1295 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9307 (42)
Average daily hot water use (litres/day)												103.8037 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1840	110.0319	105.8797	101.7276	97.5755	93.4233	93.4233	97.5755	101.7276	105.8797	110.0319	114.1840 (44)
Energy conte	169.3316	148.0985	152.8244	133.2360	127.8431	110.3189	102.2267	117.3066	118.7076	138.3423	151.0114	163.9886 (45)
Energy content (annual)												Total = Sum(45)m = 1633.2360 (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	35.9830	31.4709	32.4752	28.3127	27.1667	23.4428	21.7232	24.9277	25.2254	29.3977	32.0899	34.8476 (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	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	146.5340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.7834	26.4534	21.5133	16.2870	12.1747	10.2784	11.1062	14.4362	19.3763	24.6026	28.7149	30.6112	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.1084	321.4094	313.0910	295.3823	273.0281	252.0184	237.9826	234.6817	243.0000	260.7088	283.0629	304.0726	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	37.6534	(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)	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	(71)
Water heating gains (Table 5)	48.3642	46.8318	43.6494	39.3231	36.5143	32.5594	29.1978	33.5049	35.0352	39.5131	44.5693	46.8382	(72)
Total internal gains	463.2163	461.6547	445.2140	417.9526	388.6774	361.8164	345.2468	349.5830	364.3717	391.7847	423.3074	448.4822	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					16.2800	10.6334	0.6300	0.7000			0.7700	52.9052 (74)
West					6.6000	19.6403	0.6300	0.7000			0.7700	39.6153 (80)

Solar gains	92.5205	178.6004	299.4260	462.0900	599.8523	631.4721	593.8596	485.7386	354.9937	212.3072	114.6610	76.6821 (83)
Total gains	555.7367	640.2551	744.6400	880.0426	988.5297	993.2886	939.1065	835.3216	719.3654	604.0919	537.9683	525.1643 (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	60.6300	60.7581	60.8842	61.4835	61.5969	62.1305	62.1305	62.2303	61.9239	61.5969	61.3678	61.1302	
alpha	5.0420	5.0505	5.0589	5.0989	5.1065	5.1420	5.1420	5.1487	5.1283	5.1065	5.0912	5.0753	
util living area	0.9998	0.9995	0.9983	0.9918	0.9610	0.8621	0.7149	0.7945	0.9634	0.9970	0.9996	0.9998	(86)
MIT	19.5554	19.6767	19.9173	20.2684	20.6174	20.8716	20.9645	20.9393	20.7122	20.2786	19.8607	19.5376	(87)
Th 2	19.9639	19.9659	19.9678	19.9768	19.9785	19.9864	19.9864	19.9878	19.9834	19.9785	19.9751	19.9715	(88)
util rest of house	0.9997	0.9993	0.9976	0.9880	0.9405	0.7879	0.5782	0.6686	0.9348	0.9952	0.9994	0.9998	(89)
MIT 2	18.6309	18.7537	18.9955	19.3520	19.6916	19.9179	19.9759	19.9666	19.7900	19.3650	18.9450	18.6191	(90)
Living area fraction									fLA = Living area / (4) =				
MIT	18.7658	18.8884	19.1301	19.4858	19.8267	20.0571	20.1202	20.1086	19.9246	19.4984	19.0786	18.7531	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7658	18.8884	19.1301	19.4858	19.8267	20.0571	20.1202	20.1086	19.9246	19.4984	19.0786	18.7531	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9996	0.9990	0.9968	0.9854	0.9366	0.7940	0.5980	0.6860	0.9325	0.9939	0.9991	0.9997	(94)
Ext temp.	555.4937	639.6167	742.2539	867.2265	925.8353	788.7092	561.6145	573.0400	670.7975	600.4235	537.4807	524.9958	(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	2448.7172	2362.9093	2129.0390	1767.0404	1354.0670	901.4428	581.4893	611.6265	965.3646	1482.6333	2003.3113	2443.3367	(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	1408.5583	1158.0527	1031.7681	647.8660	318.6044	0.0000	0.0000	0.0000	0.0000	656.3641	1055.3980	1427.2456	(98)
Space heating												7703.8572	(98)
Space heating per m2										(98) / (4) =		52.1271	(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	1552.7644	1222.3890	1253.4125	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7497	0.8365	0.7790	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1164.1635	1022.5393	976.4053	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1286.6150	1220.4113	1101.7414	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	88.1651	147.2168	93.2501	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												328.6319	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	22.0413	36.8042	23.3125	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												82.1580 (107)
Energy for space heating												0.5559 (108)
Energy for space cooling												52.1271 (99)
Total												0.5559 (108)
Target Fabric Energy Efficiency (TFEE)												52.6830 (109)
												60.6 (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	147.7900 (1b)	x 2.5000 (2b)	= 369.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.4750 (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					5.0000
Infiltration rate					0.2500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.3000	4.4000	4.0000	4.0000	3.7000	3.7000	3.4000	3.7000	3.9000	3.8000	4.1000 (22)
Wind factor	1.1250	1.0750	1.1000	1.0000	1.0000	0.9250	0.9250	0.8500	0.9250	0.9750	0.9500	1.0250 (22a)
Adj infilt rate	0.2391	0.2284	0.2338	0.2125	0.2125	0.1966	0.1966	0.1806	0.1966	0.2072	0.2019	0.2178 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												78.2000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3481	0.3374	0.3428	0.3215	0.3215	0.3056	0.3056	0.2896	0.3056	0.3162	0.3109	0.3268 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
N Window (Uw = 1.40)			22.8800	1.3258	30.3333		(27)
Floor			147.7900	0.1200	17.7348		(28a)
External Wall	72.9740	22.8800	50.0940	0.1800	9.0169		(29a)
Parking Wall	41.3000		41.3000	0.2700	11.1510		(29a)
Flat Roof	28.5130		28.5130	0.1000	2.8513		(30)
Total net area of external elements Aum(A, m2)			290.5770				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		71.0874		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							30.4727 (36)
Total fabric heat loss							(33) + (36) = 101.5600 (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	42.4381	41.1427	41.7904	39.1995	39.1995	37.2562	37.2562	35.3130	37.2562	38.5517	37.9040	39.8472 (38)
Heat transfer coeff	143.9982	142.7027	143.3504	140.7595	140.7595	138.8163	138.8163	136.8731	138.8163	140.1118	139.4640	141.4072 (39)
Average = Sum(39)m / 12 =												140.4896 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9743	0.9656	0.9700	0.9524	0.9524	0.9393	0.9393	0.9261	0.9393	0.9480	0.9437	0.9568 (40)
HLP (average)												0.9506 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9307 (42)
Average daily hot water use (litres/day)												103.8037 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1840	110.0319	105.8797	101.7276	97.5755	93.4233	93.4233	97.5755	101.7276	105.8797	110.0319	114.1840 (44)
Energy conte	169.3316	148.0985	152.8244	133.2360	127.8431	110.3189	102.2267	117.3066	118.7076	138.3423	151.0114	163.9886 (45)
Energy content (annual)												Total = Sum(45)m = 1633.2360 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.3997	22.2148	22.9237	19.9854	19.1765	16.5478	15.3340	17.5960	17.8061	20.7513	22.6517	24.5983 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Store volume													10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.5000 (48)
Temperature factor from Table 2b													1.0000 (49)
Enter (49) or (54) in (55)													0.5000 (55)
Total storage loss	15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	(56)
If cylinder contains dedicated solar storage	15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.0000	(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	22.5120	(59)
Total heat required for water heating calculated for each month	208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510	(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 =													(63)
Output from w/h	208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510	(64)
Total per year (kWh/year) = Sum(64)m =													(64)
RHI water heating demand													(64)
Heat gains from water heating, kWh/month	87.3127	77.2517	81.8240	74.3106	73.5178	66.6906	65.0003	70.0144	69.4799	77.0087	80.2209	85.5361	(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	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.6166	64.4974	52.4528	39.7102	29.6838	25.0603	27.0786	35.1977	47.2423	59.9850	70.0113	74.6348	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	474.7886	479.7155	467.3000	440.8691	407.5047	376.1469	355.1980	350.2711	362.6866	389.1175	422.4819	453.8397	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	(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)	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	(71)
Water heating gains (Table 5)	117.3558	114.9579	109.9785	103.2091	98.8142	92.6259	87.3660	94.1053	96.4998	103.5064	111.4179	114.9679	(72)
Total internal gains	778.8894	773.2992	743.8598	697.9167	650.1311	607.9615	583.7709	593.7026	620.5571	666.7373	718.0396	757.5709	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					16.2800	11.9814	0.5400	0.8000	0.7700		58.3956	
West					6.6000	22.3313	0.5400	0.8000	0.7700		44.1240 (80)	

Solar gains	102.5197	178.9551	300.9245	477.6053	599.4691	674.5447	627.8637	522.9456	383.2711	227.6384	127.0116	84.0255 (83)
Total gains	881.4090	952.2543	1044.7842	1175.5220	1249.6002	1282.5062	1211.6346	1116.6482	1003.8282	894.3757	845.0512	841.5964 (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	71.2731	71.9201	71.5951	72.9130	72.9130	73.9336	73.9336	74.9833	73.9336	73.2501	73.5903	72.5790	
alpha	5.7515	5.7947	5.7730	5.8609	5.8609	5.9289	5.9289	5.9989	5.9289	5.8833	5.9060	5.8386	
util living area	0.9977	0.9958	0.9876	0.9493	0.8183	0.5545	0.3660	0.4155	0.7653	0.9677	0.9947	0.9982	(86)
MIT	20.0459	20.1597	20.3876	20.6871	20.9132	20.9930	20.9995	20.9991	20.9573	20.6836	20.3303	20.0445	(87)
Th 2	20.1048	20.1121	20.1084	20.1232	20.1232	20.1342	20.1342	20.1453	20.1342	20.1269	20.1305	20.1195	(88)
util rest of house	0.9969	0.9944	0.9830	0.9306	0.7611	0.4663	0.2674	0.3118	0.6802	0.9517	0.9926	0.9975	(89)
MIT 2	18.8306	19.0021	19.3299	19.7628	20.0462	20.1307	20.1341	20.1451	20.1053	19.7679	19.2652	18.8396	(90)
Living area fraction	19.0080	19.1711	19.4843	19.8977	20.1728	20.2566	20.2604	20.2698	fLA = Living area / (4) =	19.9015	19.4206	0.1460	(91)
MIT	19.0080	19.1711	19.4843	19.8977	20.1728	20.2566	20.2604	20.2698	20.2296	19.9015	19.4206	19.0154	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0080	19.1711	19.4843	19.8977	20.1728	20.2566	20.2604	20.2698	20.2296	19.9015	19.4206	19.0154	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	877.4417	944.8271	1022.4857	1087.0330	955.5658	614.3704	341.4156	365.1159	693.0572	846.4177	836.6723	838.5561	(94)
Ext temp.	4.8000	5.4000	7.3000	9.7000	12.8000	15.8000	17.8000	17.6000	15.0000	11.4000	7.7000	4.8000	(96)
Heat loss rate W	2045.9237	1965.1668	1746.6178	1435.4257	1037.7859	618.6466	341.5503	365.4183	725.9586	1191.1610	1634.6064	2010.1658	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	869.3507	685.6683	538.7543	250.8427	61.1718	0.0000	0.0000	0.0000	0.0000	256.4891	574.5125	871.6776	(98)
Space heating													(98)
RHI space heating demand													(98)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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	147.7900 (1b)	x 2.5000 (2b)	= 369.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	369.4750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.2500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												78.2000 (23c)
Effective ac	0.3799	0.3746	0.3693	0.3428	0.3374	0.3109	0.3109	0.3056	0.3215	0.3374	0.3481	0.3587 (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
N Window (Uw = 1.40)			22.8800	1.3258	30.3333		(27)
Floor			147.7900	0.1200	17.7348		(28a)
External Wall	72.9740	22.8800	50.0940	0.1800	9.0169		(29a)
Parking Wall	41.3000		41.3000	0.2700	11.1510		(29a)
Flat Roof	28.5130		28.5130	0.1000	2.8513		(30)
Total net area of external elements Aum(A, m ²)			290.5770				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		71.0874		(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)							30.4727 (36)
Total fabric heat loss						(33) + (36) =	101.5600 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.3245	45.6768	45.0291	41.7904	41.1427	37.9040	37.9040	37.2562	39.1995	41.1427	42.4381	43.7336 (38)
Average = Sum(39)m / 12 =	147.8846	147.2369	146.5891	143.3504	142.7027	139.4640	139.4640	138.8163	140.7595	142.7027	143.9982	145.2936 (39)
	147.8846	147.2369	146.5891	143.3504	142.7027	139.4640	139.4640	138.8163	140.7595	142.7027	143.9982	145.2936 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0006	0.9963	0.9919	0.9700	0.9656	0.9437	0.9437	0.9393	0.9524	0.9656	0.9743	0.9831 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9307 (42)
Average daily hot water use (litres/day)												103.8037 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.1840	110.0319	105.8797	101.7276	97.5755	93.4233	93.4233	97.5755	101.7276	105.8797	110.0319	114.1840 (44)
Energy content (annual)	169.3316	148.0985	152.8244	133.2360	127.8431	110.3189	102.2267	117.3066	118.7076	138.3423	151.0114	163.9886 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3997	22.2148	22.9237	19.9854	19.1765	16.5478	15.3340	17.5960	17.8061	20.7513	22.6517	24.5983 (46)
Water storage loss:												

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Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Store volume													10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.5000 (48)
Temperature factor from Table 2b													1.0000 (49)
Enter (49) or (54) in (55)													0.5000 (55)
Total storage loss													
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	(56)
If cylinder contains dedicated solar storage													
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	(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													
208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510	202.7510	(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 =													(63)
Output from w/h													
208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510	202.7510	(64)
Heat gains from water heating, kWh/month													
87.3127	77.2517	81.8240	74.3106	73.5178	66.6906	65.0003	70.0144	69.4799	77.0087	80.2209	85.5361	85.5361	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
72.6166	64.4974	52.4528	39.7102	29.6838	25.0603	27.0786	35.1977	47.2423	59.9850	70.0113	74.6348	74.6348	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
474.7886	479.7155	467.3000	440.8691	407.5047	376.1469	355.1980	350.2711	362.6866	389.1175	422.4819	453.8397	453.8397	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	(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)													
-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	(71)
Water heating gains (Table 5)													
117.3558	114.9579	109.9785	103.2091	98.8142	92.6259	87.3660	94.1053	96.4998	103.5064	111.4179	114.9679	114.9679	(72)
Total internal gains													
778.8894	773.2992	743.8598	697.9167	650.1311	607.9615	583.7709	593.7026	620.5571	666.7373	718.0396	757.5709	757.5709	(73)

6. Solar gains

[Jan]													
Area													
m2													
Solar flux													
Table 6a													
W/m2													
Specific data													
or Table 6b													
Specific data													
or Table 6c													
Access													
factor													
Table 6d													
Gains													
W													
North													
West													
16.2800													
10.6334													
0.5400													
0.8000													
0.7700													
0.8000													
51.8255													(74)
38.8068													(80)
Solar gains	90.6323	174.9555	293.3153	452.6596	587.6104	618.5849	581.7400	475.8255	347.7489	207.9744	112.3209	75.1171	(83)
Total gains	869.5217	948.2547	1037.1751	1150.5763	1237.7415	1226.5464	1165.5109	1069.5281	968.3060	874.7116	830.3605	832.6880	(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	69.4000	69.7053	70.0133	71.5951	71.9201	73.5903	73.5903	73.9336	72.9130	71.9201	71.2731	70.6376	
alpha	5.6267	5.6470	5.6676	5.7730	5.7947	5.9060	5.9060	5.9289	5.8609	5.7947	5.7515	5.7092	
util living area													
0.9982	0.9966	0.9912	0.9664	0.8808	0.6936	0.5208	0.5854	0.8555	0.9803	0.9963	0.9986	0.9986	(86)
MIT	19.9537	20.0680	20.2819	20.5910	20.8442	20.9724	20.9956	20.9918	20.9059	20.5879	20.2291	19.9452	(87)
Th 2	20.0828	20.0865	20.0901	20.1084	20.1121	20.1305	20.1305	20.1342	20.1232	20.1121	20.1048	20.0974	(88)
util rest of house													
0.9976	0.9954	0.9880	0.9539	0.8395	0.6131	0.4210	0.4812	0.7920	0.9707	0.9948	0.9981	0.9981	(89)
MIT 2	18.6796	18.8492	19.1630	19.6184	19.9567	20.1119	20.1288	20.1307	20.0450	19.6225	19.0984	18.6780	(90)
Living area fraction													
fLA = Living area / (4) =												0.1460	(91)
MIT	18.8655	19.0271	19.3263	19.7604	20.0862	20.2375	20.2553	20.2564	20.1707	19.7634	19.2635	18.8630	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8655	19.0271	19.3263	19.7604	20.0862	20.2375	20.2553	20.2564	20.1707	19.7634	19.2635	18.8630	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9964	0.9935	0.9843	0.9477	0.8381	0.6236	0.4355	0.4964	0.7959	0.9655	0.9928	0.9971	0.9971	(94)
Useful gains	866.3660	942.1098	1020.8979	1090.4190	1037.3282	764.8185	507.6119	530.8731	770.6988	844.5726	824.3535	830.3071	(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													
2154.0189	2080.0328	1880.1916	1556.8404	1196.7361	786.2270	509.7897	535.3262	854.5021	1307.6450	1751.5166	2130.4357	2130.4357	(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													
958.0138	764.6842	639.3145	335.8234	118.5995	0.0000	0.0000	0.0000	0.0000	344.5258	667.5575	967.2957	967.2957	(98)
Space heating												4795.8144	(98)
Space heating per m2												32.4502	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1310.9619	1032.0338	1055.0038	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8616	0.9264	0.8898	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1129.5230	956.0673	938.7370	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1330.9829	1263.7268	1149.8623	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	145.0511	228.8986	157.0773	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												531.0270 (104)
Intermittency factor (Table 10b)												0.4032 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	14.6214	23.0734	15.8337	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												53.5285 (107)
												0.3622 (108)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	1.0000 (303a)
Fraction of total space heat from community Heat pump	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	4795.8144 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	5035.6051 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2089.6320 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2194.1136 (310a)
Electricity used for heat distribution	72.2972 (313)
Cooling System Energy Efficiency Ratio	6.7500 (314)
Space cooling (if there is a fixed cooling system, if not enter 0)	7.9301 (315)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9875)	
mechanical ventilation fans (SFP = 0.9875)	445.1250 (330a)
Total electricity for the above, kWh/year	445.1250 (331)
Electricity for lighting (calculated in Appendix L)	512.9727 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 1.35 * 951 * 0.80) =	-821.3322 (333)
Total delivered energy for all uses	7374.4143 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	5035.6051	4.2400	213.5097 (340a)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2194.1136	4.2400	93.0304 (342a)
Space cooling	7.9301	13.1900	1.0460 (348)
Mechanical ventilation fans	445.1250	13.1900	58.7120 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	512.9727	13.1900	67.6611 (350)
Additional standing charges			120.0000 (351)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (352)
Total energy cost			553.9591 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.4200 (356)
Energy cost factor (ECF)	1.2068 (357)
SAP value	83.1649
SAP rating (Section 12)	83 (358)
SAP band	B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			300.0000 (367a)
Space heating from Heat pump	2409.9062	0.5190	1250.7413 (367)
Electrical energy for heat distribution	72.2972	0.5190	37.5222 (372)
Total CO2 associated with community systems			1288.2636 (373)
(negative value allowed since DFEE <= TFEE)			
Space and water heating			1288.2636 (376)
Space cooling	7.9301	0.5190	4.1157 (377)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Pumps and fans	445.1250	0.5190	231.0199 (378)
Energy for lighting	512.9727	0.5190	266.2328 (379)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-821.3322	0.5190	-426.2714 (380)
CO2 emissions per m2			1363.3606 (383)
EI value			9.2200 (384)
EI rating			90.5239 (384a)
EI band			91 (385)
			B

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

Space heating energy efficiency	1.00 × 4.240 × 1.05	
= 4.452, stars = 4		
Space heating environmental impact	1.00 × 0.519 × 1.05 / 3.0000	
= 0.1817, stars = 5		
Water heating energy efficiency		4.452, stars = 4
Water heating environmental impact		0.1817, 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	147.7900 (1b)	x 2.5000 (2b)	= 369.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	369.4750 (5)

2. Ventilation rate

					main heating	secondary heating		other		total	m3 per hour	
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											5.0000	
Infiltration rate											0.2500	(18)
Number of sides sheltered											2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2125 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.5000	4.3000	4.4000	4.0000	4.0000	3.7000	3.7000	3.4000	3.7000	3.9000	3.8000	4.1000 (22)
Adj infilt rate	1.1250	1.0750	1.1000	1.0000	1.0000	0.9250	0.9250	0.8500	0.9250	0.9750	0.9500	1.0250 (22a)
	0.2391	0.2284	0.2338	0.2125	0.2125	0.1966	0.1966	0.1806	0.1966	0.2072	0.2019	0.2178 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												78.2000 (23c)
Effective ac	0.3481	0.3374	0.3428	0.3215	0.3215	0.3056	0.3056	0.2896	0.3056	0.3162	0.3109	0.3268 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings	NetArea	U-value	A x U	K-value	A x K					
	m2		m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
N Window (Uw = 1.40)				22.8800	1.3258	30.3333						(27)	
Floor				147.7900	0.1200	17.7348						(28a)	
External Wall	72.9740		22.8800	50.0940	0.1800	9.0169						(29a)	
Parking Wall	41.3000			41.3000	0.2700	11.1510						(29a)	
Flat Roof	28.5130			28.5130	0.1000	2.8513						(30)	
Total net area of external elements Aum(A, m2)				290.5770								(31)	
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =		71.0874						(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												30.4727 (36)	
Total fabric heat loss							(33) + (36) =					101.5600 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	42.4381	41.1427	41.7904	39.1995	39.1995	37.2562	37.2562	35.3130	37.2562	38.5517	37.9040	39.8472	(38)
Heat transfer coeff	143.9982	142.7027	143.3504	140.7595	140.7595	138.8163	138.8163	136.8731	138.8163	140.1118	139.4640	141.4072	(39)
Average = Sum(39)m / 12 =												140.4896	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9743	0.9656	0.9700	0.9524	0.9524	0.9393	0.9393	0.9261	0.9393	0.9480	0.9437	0.9568	(40)
HLP (average)												0.9506	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9307 (42)
Average daily hot water use (litres/day)												103.8037 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.1840	110.0319	105.8797	101.7276	97.5755	93.4233	93.4233	97.5755	101.7276	105.8797	110.0319	114.1840 (44)
Energy conte	169.3316	148.0985	152.8244	133.2360	127.8431	110.3189	102.2267	117.3066	118.7076	138.3423	151.0114	163.9886 (45)
Energy content (annual)	Total = Sum(45)m =											1633.2360 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.3997	22.2148	22.9237	19.9854	19.1765	16.5478	15.3340	17.5960	17.8061	20.7513	22.6517	24.5983 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Store volume												10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.5000 (48)
Temperature factor from Table 2b												1.0000 (49)
Enter (49) or (54) in (55)												0.5000 (55)
Total storage loss												
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	(56)
If cylinder contains dedicated solar storage												
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	(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	(59)
Total heat required for water heating calculated for each month												
208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510	(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	(63)
Solar input (sum of months) = Sum(63)m =												(63)
Output from w/h												
208.0940	183.1097	191.5868	170.7480	166.6055	147.8309	140.9891	156.0690	156.2196	177.1047	188.5234	202.7510	(64)
Heat gains from water heating, kWh/month												
87.3127	77.2517	81.8240	74.3106	73.5178	66.6906	65.0003	70.0144	69.4799	77.0087	80.2209	85.5361	(65)
Total per year (kWh/year) = Sum(64)m =												(64)
2089.6320												

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	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	175.8409	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
72.6166	64.4974	52.4528	39.7102	29.6838	25.0603	27.0786	35.1977	47.2423	59.9850	70.0113	74.6348	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
474.7886	479.7155	467.3000	440.8691	407.5047	376.1469	355.1980	350.2711	362.6866	389.1175	422.4819	453.8397	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	55.5148	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	-117.2272	(71)
Water heating gains (Table 5)												
117.3558	114.9579	109.9785	103.2091	98.8142	92.6259	87.3660	94.1053	96.4998	103.5064	111.4179	114.9679	(72)
Total internal gains												
778.8894	773.2992	743.8598	697.9167	650.1311	607.9615	583.7709	593.7026	620.5571	666.7373	718.0396	757.5709	(73)

6. Solar gains

[Jan]												
Area												
m2												
Solar flux												
Table 6a												
W/m2												
Specific data												
or Table 6b												
Specific data												
or Table 6c												
Access												
factor												
Table 6d												
Gains												
W												
North												
West												
16.2800												
6.6000												
11.9814												
22.3313												
0.5400												
0.5400												
0.8000												
0.8000												
0.7700												
0.7700												
58.3956												(74)
44.1240												(80)
Solar gains	102.5197	178.9551	300.9245	477.6053	599.4691	674.5447	627.8637	522.9456	383.2711	227.6384	127.0116	84.0255 (83)
Total gains	881.4090	952.2543	1044.7842	1175.5220	1249.6002	1282.5062	1211.6346	1116.6482	1003.8282	894.3757	845.0512	841.5964 (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	71.2731	71.9201	71.5951	72.9130	72.9130	73.9336	73.9336	74.9833	73.9336	73.2501	73.5903	72.5790
alpha	5.7515	5.7947	5.7730	5.8609	5.8609	5.9289	5.9289	5.9989	5.9289	5.8833	5.9060	5.8386
util living area												
	0.9977	0.9958	0.9876	0.9493	0.8183	0.5545	0.3660	0.4155	0.7653	0.9677	0.9947	0.9982 (86)
MIT	20.0459	20.1597	20.3876	20.6871	20.9132	20.9930	20.9995	20.9991	20.9573	20.6836	20.3303	20.0445 (87)
Th 2	20.1048	20.1121	20.1084	20.1232	20.1232	20.1342	20.1342	20.1453	20.1342	20.1269	20.1305	20.1195 (88)
util rest of house												
	0.9969	0.9944	0.9830	0.9306	0.7611	0.4663	0.2674	0.3118	0.6802	0.9517	0.9926	0.9975 (89)
MIT 2	18.8306	19.0021	19.3299	19.7628	20.0462	20.1307	20.1341	20.1451	20.1053	19.7679	19.2652	18.8396 (90)
Living area fraction												
									fLA = Living area / (4) =			0.1460 (91)
MIT	19.0080	19.1711	19.4843	19.8977	20.1728	20.2566	20.2604	20.2698	20.2296	19.9015	19.4206	19.0154 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0080	19.1711	19.4843	19.8977	20.1728	20.2566	20.2604	20.2698	20.2296	19.9015	19.4206	19.0154 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9922	0.9787	0.9247	0.7647	0.4790	0.2818	0.3270	0.6904	0.9464	0.9901	0.9964	(94)
Useful gains	877.4417	944.8271	1022.4857	1087.0330	955.5658	614.3704	341.4156	365.1159	693.0572	846.4177	836.6723	838.5561	(95)
Ext temp.	4.8000	5.4000	7.3000	9.7000	12.8000	15.8000	17.8000	17.6000	15.0000	11.4000	7.7000	4.8000	(96)
Heat loss rate W													
	2045.9237	1965.1668	1746.6178	1435.4257	1037.7859	618.6466	341.5503	365.4183	725.9586	1191.1610	1634.6064	2010.1658	(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													
	869.3507	685.6683	538.7543	250.8427	61.1718	0.0000	0.0000	0.0000	0.0000	256.4891	574.5125	871.6776	(98)
Space heating												4108.4669	(98)
Space heating per m2												(98) / (4) =	27.7994 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.8000	5.4000	7.3000	9.7000	12.8000	15.8000	17.8000	17.6000	15.0000	11.4000	7.7000	4.8000	
Heat loss rate W													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1138.2936	860.6610	875.9877	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9273	0.9707	0.9548	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1055.5857	835.4483	836.4194	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1396.3904	1317.6376	1204.9377	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	245.3794	358.7488	274.1776	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												878.3058	(104)
Intermittency factor (Table 10b)												0.4032	(105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	24.7347	36.1625	27.6376	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2												88.5348	(107)
												0.5991	(108)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	4108.4669	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	4313.8903	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2089.6320	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2194.1136	(310a)
Electricity used for heat distribution	65.0800	(313)
Cooling System Energy Efficiency Ratio	6.7500	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	13.1163	(315)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9875)		
mechanical ventilation fans (SFP = 0.9875)	445.1250	(330a)
Total electricity for the above, kWh/year	445.1250	(331)
Electricity for lighting (calculated in Appendix L)	512.9727	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.35 * 1019 * 0.80) =	-880.1188	(333)
Total delivered energy for all uses	6599.0990	(338)

10b. Fuel costs - using BEDF prices (520)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	4313.8903	11.8800	512.4902	(340a)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2194.1136	11.8800	260.6607	(342a)
Space cooling	13.1163	36.8500	4.8333	(348)
Mechanical ventilation fans	445.1250	36.8500	164.0286	(349)
Pumps and fans for heating	0.0000	0.0000	0.0000	(349)
Energy for lighting	512.9727	36.8500	189.0304	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit	0.0000	0.0000	0.0000	(352)
Total energy cost			1235.0432	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367a)
Space heating from Heat pump	2169.3346	0.5190	1125.8847	(367)
Electrical energy for heat distribution	65.0800	0.5190	33.7765	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1159.6612	(373)
Space and water heating			1159.6612	(376)
Space cooling	13.1163	0.5190	6.8073	(377)
Pumps and fans	445.1250	0.5190	231.0199	(378)
Energy for lighting	512.9727	0.5190	266.2328	(379)
Energy saving/generation technologies				
PV Unit	-880.1188	0.5190	-456.7816	(380)
Total kg/year			1206.9396	(383)

13b. Primary energy - Community heating scheme

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			300.0000 (367a)
Space heating from Heat pump	2169.3346	3.0700	6659.8572 (367)
Electrical energy for heat distribution	65.0800	3.0700	199.7957 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			6859.6530 (373)
Space and water heating			6859.6530 (376)
Space cooling	13.1163	3.0700	40.2669 (377)
Pumps and fans	445.1250	3.0700	1366.5338 (378)
Energy for lighting	512.9727	3.0700	1574.8262 (379)
Energy saving/generation technologies			
PV Unit	-880.1188	3.0700	-2701.9647 (380)
Primary energy kWh/year			7139.3152 (383)
Primary energy kWh/m2/year			48.3072 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 83
Current environmental impact rating: B 91

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

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

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 520 TEST (05 Jun 2023)
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	£358	£358	£0
Community scheme	£877	£877	£0
Space heating	£781	£781	£0
Space cooling	£5	£5	£0
Water heating	£261	£261	£0
Lighting	£189	£189	£0
Total cost of fuels	£1235	£1235	£0
Total cost of uses	£1236	£1236	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	48 kWh/m²	48 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type SemiDetached Flat
Number of storeys 1
Cross ventilation possible No
SAP Region Thames Valley
Front of dwelling faces East
Overshading Average or unknown
Thermal mass parameter 250.0
Night ventilation No
Ventilation rate during hot weather (ach) 2.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient 243.85 (P1)
Transmission heat loss coefficient 101.56 (37)
Summer heat loss coefficient 345.41 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North	0.000	1.000	None
West	0.000	1.000	None
Solar shading			
Orientation	Z blinds	Solar access	Z overhangs Z summer
North	0.850	0.90	1.000 0.765 (P8)
West	0.850	0.90	1.000 0.765 (P8)
[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b
North	16.2800	81.1852	0.5400
West	6.6000	117.5071	0.5400
total:			
			FF Specific data or Table 6c
North			0.8000
West			0.8000
			Shading
			Gains W
			393.1143
			230.6724
			623.7867

Solar gains	Jun	Jul	Aug	
	670	624	523	(P3)
Internal gains	608	584	594	
Total summer gains	1278	1208	1116	(P5)
Summer gain/loss ratio	3.70	3.50	3.23	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.95	21.65	21.28	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			