

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	2 Bed 2F Apartment (ASHP+PV)				Issued on Date	15/12/2022
Assessment Reference	091	Prop Type Ref	2F Apartment-Det-As			
Property	Plot 091, 2 Bed, K, B					
SAP Rating	93 A	DER	9.55	TER	28.29	
Environmental	94 A	% DER<TER	66.25			
CO ₂ Emissions (t/year)	0.40	DFEE	40.15	TFEE	51.29	
General Requirements Compliance	Pass	% DFEE<TFEE	21.72			
Assessor Details	Mr. Christopher MacDougall, Chris MacDougall, Tel: 02032 902 902, chris.macdougall@aessc.co.uk				Assessor ID	Q920-0001
Client						

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

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DWELLING AS DESIGNED

Top-floor flat, total floor area 62 m²

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

1a TER and DER

Fuel for main heating: Electricity
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 28.29 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.55 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.2 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Secondary heating system: None

5 Cylinder insulation

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

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)
Specific fan power: 0.1700 0.1800
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing South East: 1.68 m², No overhang
Windows facing South West: 3.26 m², No overhang
Windows facing North West: 5.95 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.09 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.90 W/m²K
Thermal bridging y-value 0.036 W/m²K
Photovoltaic array 1.20 kW

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6700 (1b)	x 2.3600 (2b)	= 145.5412 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5412 (5)

2. Ventilation rate

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2365	0.2318	0.2272	0.2040	0.1994	0.1762	0.1762	0.1716	0.1855	0.1994	0.2086	0.2179 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			1.9800	1.0000	1.9800			(26)
Window (Uw = 1.20)			7.0900	1.1450	8.1183			(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379			(27)
100mm Knauf Supafil 34	57.1100	10.8900	46.2200	0.2500	11.5550	52.8000	2440.4160	(29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000	(29a)
500mm Loft roll	61.6700		61.6700	0.0900	5.5503	9.0000	555.0300	(30)
Total net area of external elements Aum(A, m2)			136.0100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9865			(33)
E-FC-4			61.6700			70.0000	4316.9000	(32d)
Timber partition			111.2500			9.0000	1001.2500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =				9118.7960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								147.8644 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.9466 (36)
Total fabric heat loss				(33) + (36) =				39.9331 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.0143	24.0143	24.0143	24.0143	24.0143	24.0143	24.0143	24.0143	24.0143	24.0143	24.0143	24.0143 (38)
Heat transfer coeff	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474 (39)
Average = Sum(39)m / 12 =												63.9474 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0369	1.0369	1.0369	1.0369	1.0369	1.0369	1.0369	1.0369	1.0369	1.0369	1.0369	1.0369 (40)
HLP (average)												1.0369 (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												2.0284 (42)
Average daily hot water use (litres/day)												82.3754 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.6129	87.3179	84.0229	80.7279	77.4328	74.1378	74.1378	77.4328	80.7279	84.0229	87.3179	90.6129 (44)
Energy conte	134.3763	117.5264	121.2767	105.7320	101.4523	87.5457	81.1239	93.0909	94.2027	109.7842	119.8380	130.1363 (45)
Energy content (annual)												Total = Sum(45)m = 1296.0854 (45)

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Distribution loss (46)m = 0.15 x (45)m	20.1564	17.6290	18.1915	15.8598	15.2179	13.1318	12.1686	13.9636	14.1304	16.4676	17.9757	19.5204 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8424 (55)
Total storage loss	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144 (56)
If cylinder contains dedicated solar storage	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	183.7531	162.1248	170.6535	153.5160	150.8291	135.3297	130.5007	142.4677	141.9867	159.1610	167.6220	179.5131 (62)
WWHRS	-42.1034	-37.0404	-37.8074	-31.1420	-28.9342	-23.8821	-20.2356	-24.4927	-25.1967	-31.1230	-36.0172	-40.6870 eq. (G10)
Total of WWHRS savings												-378.6615
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	141.6498	125.0844	132.8462	122.3740	121.8949	111.4475	110.2652	117.9750	116.7900	128.0380	131.6048	138.8261 (64)
Heat gains from water heating, kWh/month	84.1816	74.7562	79.8259	73.3831	73.2343	67.3361	66.4751	70.4542	69.5496	76.0047	78.0733	82.7718 (65)
Total per year (kWh/year) = Sum(64)m = 1498.7958 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1799	14.3708	11.6871	8.8479	6.6139	5.5837	6.0334	7.8425	10.5262	13.3654	15.5994	16.6295 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1382	178.9763	174.3443	164.4832	152.0353	140.3361	132.5203	130.6822	135.3142	145.1753	157.6232	169.3224 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375 (71)
Water heating gains (Table 5)	113.1473	111.2444	107.2929	101.9209	98.4333	93.5224	89.3483	94.6965	96.5967	102.1568	108.4352	111.2524 (72)
Total internal gains	359.8919	358.0181	346.7509	328.6786	310.5091	292.8688	281.3286	286.6476	295.8636	314.1241	335.0843	350.6309 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				1.6800	36.7938	0.4600	0.0000	0.7700	21.8944 (77)			
Southwest				3.2600	36.7938	0.4600	0.0000	0.7700	42.4855 (79)			
Northwest				2.1500	11.2829	0.4600	0.0000	0.7700	8.5923 (81)			
Northwest				3.8000	11.2829	0.4300	0.0000	0.7700	14.1960 (81)			

Solar gains	87.1682	156.0490	233.6186	323.1647	392.7312	403.4213	383.3106	329.3424	264.3027	177.8884	105.7859	73.7059 (83)
Total gains	447.0601	514.0671	580.3695	651.8434	703.2403	696.2902	664.6392	615.9900	560.1663	492.0125	440.8701	424.3367 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107
alpha	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407
util living area	0.9751	0.9584	0.9233	0.8462	0.7145	0.5495	0.4125	0.4601	0.6829	0.8847	0.9592	0.9792 (86)
Tweekday	18.1040	18.4208	18.9007	19.4418	19.8303	20.0030	20.0436	20.0381	19.9308	19.4316	18.6617	18.0141
Tweekend	20.0522	20.1948	20.4131	20.6668	20.8617	20.9601	20.9892	20.9838	20.9120	20.6554	20.3011	20.0119
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	19.5372	19.7545	20.0942	20.4797	20.7865	20.9386	20.9833	20.9751	20.8626	20.4681	19.9087	19.4751 (87)
Th 2	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527 (88)
util rest of house	0.9704	0.9507	0.9091	0.8183	0.6665	0.4798	0.3282	0.3722	0.6155	0.8571	0.9502	0.9752 (89)
Tweekday	18.1040	18.4208	18.9007	19.4418	19.8303	20.0030	20.0436	20.0381	19.9308	19.4316	18.6617	18.0141
Tweekend	18.1040	18.4208	18.9007	19.4418	19.8303	20.0030	20.0436	20.0381	19.9308	19.4316	18.6617	18.0141
MIT 2	18.1040	18.4208	18.9007	19.4418	19.8303	20.0030	20.0436	20.0381	19.9308	19.4316	18.6617	18.0141 (90)
Living area fraction									fLA = Living area / (4) =			0.4010 (91)
MIT	18.6787	18.9556	19.3793	19.8580	20.2138	20.3782	20.4204	20.4138	20.3045	19.8473	19.1618	18.6000 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6787	18.9556	19.3793	19.8580	20.2138	20.3782	20.4204	20.4138	20.3045	19.8473	19.1618	18.6000 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9614	0.9395	0.8972	0.8119	0.6751	0.5045	0.3614	0.4065	0.6346	0.8502	0.9396	0.9670 (94)

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Useful gains	429.8204	482.9598	520.6818	529.2588	474.7769	351.2680	240.2234	250.3832	355.4539	418.3018	414.2366	410.3237 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
Month fracti	919.4822	898.8222	823.5977	700.7374	544.4328	369.5001	244.3035	256.6731	396.7604	591.3392	771.3206	920.8419 (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	364.3084	279.4595	225.3695	123.4645	51.8240	0.0000	0.0000	0.0000	0.0000	128.7398	257.1005	379.8256 (98)
Space heating per m2												1810.0917 (98)
												(98) / (4) = 29.3513 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												197.4448 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												916.7586 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	364.3084	279.4595	225.3695	123.4645	51.8240	0.0000	0.0000	0.0000	0.0000	128.7398	257.1005	379.8256 (98)
Space heating efficiency (main heating system 1)	197.4448	197.4448	197.4448	197.4448	197.4448	0.0000	0.0000	0.0000	0.0000	197.4448	197.4448	197.4448 (210)
Space heating fuel (main heating system)	184.5116	141.5381	114.1431	62.5312	26.2473	0.0000	0.0000	0.0000	0.0000	65.2030	130.2139	192.3705 (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	141.6498	125.0844	132.8462	122.3740	121.8949	111.4475	110.2652	117.9750	116.7900	128.0380	131.6048	138.8261 (64)
Efficiency of water heater	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (216)
Fuel for water heating, kWh/month	83.1864	73.4581	78.0163	71.8663	71.5850	65.4496	64.7552	69.2829	68.5870	75.1926	77.2873	81.5281 (219)
Water heating fuel used												880.1949 (219)
Annual totals kWh/year												916.7586 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.7450, total flow = 21.0000, SFP = 0.2260)												
mechanical ventilation fans (SFP = 0.2260)												40.1202 (230a)
Total electricity for the above, kWh/year												40.1202 (231)
Electricity for lighting (calculated in Appendix L)												285.7414 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.20 * 1029 * 1.00) =									-988.0192			-988.0192 (233)
Total delivered energy for all uses												1134.7957 (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	916.7586	0.5190	475.7977 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	880.1949	0.5190	456.8211 (264)
Space and water heating			932.6188 (265)
Pumps and fans	40.1202	0.5190	20.8224 (267)
Energy for lighting	285.7414	0.5190	148.2998 (268)
Energy saving/generation technologies			
PV Unit	-988.0192	0.5190	-512.7820 (269)
Total CO2, kg/year			588.9590 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			9.5500 (273)

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

DER			9.5500 ZC1
Total Floor Area		TFA	61.6700
Assumed number of occupants		N	2.0284
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.0210 ZC2
CO2 emissions from cooking, equation (L16)			2.7190 ZC3
Total CO2 emissions			29.2900 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			29.2900 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6700 (1b)	x 2.3600 (2b)	= 145.5412 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5412 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1374 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3874 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3584 (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												
	0.4569	0.4480	0.4390	0.3942	0.3852	0.3404	0.3404	0.3315	0.3584	0.3852	0.4032	0.4211 (22b)
Effective ac	0.6044	0.6003	0.5964	0.5777	0.5742	0.5580	0.5580	0.5549	0.5642	0.5742	0.5813	0.5887 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Opening Type (Uw = 1.40)			10.8900	1.3258	14.4375		(27)
100mm Knauf Supafil 34	57.1100	10.8900	46.2200	0.1800	8.3196		(29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450		(29a)
500mm Loft roll	61.6700		61.6700	0.1300	8.0171		(30)
Total net area of external elements Aum (m ²)			136.0100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.4992		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.7981 (36)
Total fabric heat loss							(33) + (36) = 42.2973 (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	29.0277	28.8330	28.6422	27.7459	27.5782	26.7976	26.7976	26.6530	27.0983	27.5782	27.9175	28.2721 (38)
Heat transfer coeff	71.3250	71.1303	70.9395	70.0432	69.8755	69.0949	69.0949	68.9503	69.3956	69.8755	70.2148	70.5694 (39)
Average = Sum(39)m / 12 =												70.0424 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1566	1.1534	1.1503	1.1358	1.1331	1.1204	1.1204	1.1181	1.1253	1.1331	1.1386	1.1443 (40)
HLP (average)												1.1358 (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												2.0284 (42)
Average daily hot water use (litres/day)												82.3754 (43)
Daily hot water use	90.6129	87.3179	84.0229	80.7279	77.4328	74.1378	74.1378	77.4328	80.7279	84.0229	87.3179	90.6129 (44)
Energy conte	134.3763	117.5264	121.2767	105.7320	101.4523	87.5457	81.1239	93.0909	94.2027	109.7842	119.8380	130.1363 (45)
Energy content (annual)										Total = Sum(45)m =		1296.0854 (45)
Distribution loss (46)m = 0.15 x (45)m	20.1564	17.6290	18.1915	15.8598	15.2179	13.1318	12.1686	13.9636	14.1304	16.4676	17.9757	19.5204 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	185.3024	163.5241	172.2028	155.0153	152.3784	136.8290	132.0500	144.0170	143.4860	160.7102	169.1213	181.0624 (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	185.3024	163.5241	172.2028	155.0153	152.3784	136.8290	132.0500	144.0170	143.4860	160.7102	169.1213	181.0624 (64)
Heat gains from water heating, kWh/month	85.4210	75.8757	81.0654	74.5825	74.4738	68.5356	67.7146	71.6936	70.7490	77.2441	79.2728	84.0112 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1799	14.3708	11.6871	8.8479	6.6139	5.5837	6.0334	7.8425	10.5262	13.3654	15.5994	16.6295	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1382	178.9763	174.3443	164.4832	152.0353	140.3361	132.5203	130.6822	135.3142	145.1753	157.6232	169.3224	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	(71)
Water heating gains (Table 5)	114.8132	112.9103	108.9588	103.5868	100.0991	95.1883	91.0142	96.3623	98.2625	103.8227	110.1011	112.9182	(72)
Total internal gains	364.5578	362.6840	351.4168	333.3445	315.1749	297.5347	285.9945	291.3135	300.5295	318.7899	339.7502	355.2967	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Southeast				1.6800	36.7938	0.6300	0.7000	0.7700	18.8911 (77)				
Southwest				3.2600	36.7938	0.6300	0.7000	0.7700	36.6576 (79)				
Northwest				5.9500	11.2829	0.6300	0.7000	0.7700	20.5169 (81)				
Solar gains	76.0656	136.3827	204.7062	283.9819	345.7772	355.4583	337.6303	289.6659	231.8661	155.6125	92.3501	64.2932	(83)
Total gains	440.6233	499.0667	556.1230	617.3264	660.9521	652.9929	623.6248	580.9794	532.3956	474.4025	432.1002	419.5900	(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	60.0440	60.2083	60.3703	61.1428	61.2895	61.9820	61.9820	62.1119	61.7134	61.2895	60.9934	60.6869	
alpha	5.0029	5.0139	5.0247	5.0762	5.0860	5.1321	5.1321	5.1408	5.1142	5.0860	5.0662	5.0458	
util living area	0.9956	0.9912	0.9786	0.9364	0.8285	0.6446	0.4812	0.5346	0.7891	0.9571	0.9910	0.9966	(86)
MIT	19.8555	20.0099	20.2623	20.5885	20.8438	20.9675	20.9940	20.9899	20.9102	20.5835	20.1640	19.8301	(87)
Th 2	19.9549	19.9575	19.9600	19.9717	19.9739	19.9842	19.9842	19.9861	19.9802	19.9739	19.9695	19.9648	(88)
util rest of house	0.9942	0.9883	0.9713	0.9146	0.7752	0.5556	0.3734	0.4226	0.7093	0.9378	0.9874	0.9954	(89)
MIT 2	18.4433	18.6694	19.0350	19.5001	19.8267	19.9636	19.9821	19.9822	19.9120	19.5038	18.9034	18.4134	(90)
Living area fraction	19.0096	19.2070	19.5272	19.9365	20.2346	20.3661	20.3878	20.3863	20.3123	19.9368	19.4089	18.9815	(91)
MIT	19.0096	19.2070	19.5272	19.9365	20.2346	20.3661	20.3878	20.3863	20.3123	19.9368	19.4089	18.9815	(92)
Temperature adjustment	19.0096	19.2070	19.5272	19.9365	20.2346	20.3661	20.3878	20.3863	20.3123	19.9368	19.4089	18.9815	(93)
adjusted MIT	19.0096	19.2070	19.5272	19.9365	20.2346	20.3661	20.3878	20.3863	20.3123	19.9368	19.4089	18.9815	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	437.2743	491.8242	538.0148	564.0448	522.1030	385.4820	259.9489	271.7348	392.6500	444.4981	425.5560	417.0463	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1049.1624	1017.6597	924.1430	773.0355	596.3581	398.4096	261.7205	274.8551	431.1065	652.4136	864.2683	1043.1219	(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	455.2447	353.3615	287.2794	150.4733	55.2458	0.0000	0.0000	0.0000	0.0000	154.6891	315.8728	465.8003	(98)
Space heating												2237.9669	(98)
Space heating per m2												36.2894	(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													2393.5475 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.2447	353.3615	287.2794	150.4733	55.2458	0.0000	0.0000	0.0000	0.0000	154.6891	315.8728	465.8003	(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)	486.8928	377.9267	307.2507	160.9340	59.0864	0.0000	0.0000	0.0000	0.0000	165.4429	337.8319	498.1821	(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	185.3024	163.5241	172.2028	155.0153	152.3784	136.8290	132.0500	144.0170	143.4860	160.7102	169.1213	181.0624	(64)
Efficiency of water heater (217)m	87.1207	86.8172	86.1698	84.7347	82.3920	79.8000	79.8000	79.8000	79.8000	84.7122	86.4575	87.2263	(216)
Fuel for water heating, kWh/month	212.6963	188.3545	199.8412	182.9419	184.9431	171.4649	165.4762	180.4724	179.8070	189.7131	195.6120	207.5778	(219)
Water heating fuel used												2258.9003	(219)
Annual totals kWh/year													
Space heating fuel - main system												2393.5475	(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)												285.7414	(232)
Total delivered energy for all uses												5013.1892	(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	2393.5475	0.2160	517.0063 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2258.9003	0.2160	487.9225 (264)
Space and water heating			1004.9287 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	285.7414	0.5190	148.2998 (268)
Total CO2, kg/m2/year			1192.1535 (272)
Emissions per m2 for space and water heating			16.2953 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4047 (272b)
Emissions per m2 for pumps and fans			0.6312 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2953 * 1.55) + 2.4047 + 0.6312, rounded to 2 d.p.			28.2900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6700 (1b)	x 2.3600 (2b)	= 145.5412 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5412 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1374 (8)
Pressure test					Yes
Measured/design AP50					4.0100
Infiltration rate					0.3379 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3126 (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	0.3985	0.3907	0.3829	0.3438	0.3360	0.2969	0.2969	0.2891	0.3126	0.3360	0.3516	0.3673 (22b)
Effective ac	0.5794	0.5763	0.5733	0.5591	0.5565	0.5441	0.5441	0.5418	0.5489	0.5565	0.5618	0.5674 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.0000	1.9800		(26)
Window (Uw = 1.20)			7.0900	1.1450	8.1183		(27)
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
100mm Knauf Supafil 34	57.1100	10.8900	46.2200	0.2500	11.5550	52.8000	2440.4160 (29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)
500mm Loft roll	61.6700		61.6700	0.0900	5.5503	9.0000	555.0300 (30)
Total net area of external elements Aum(A, m ²)			136.0100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9865		(33)
E-FC-4			61.6700			70.0000	4316.9000 (32d)
Timber partition			111.2500			9.0000	1001.2500 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			9118.7960 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							147.8644 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.9466 (36)
Total fabric heat loss						(33) + (36) =	39.9331 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.8284	27.6803	27.5352	26.8533	26.7257	26.1318	26.1318	26.0218	26.3606	26.7257	26.9838	27.2536 (38)
Heat transfer coeff	67.7616	67.6135	67.4683	66.7864	66.6588	66.0649	66.0649	65.9549	66.2937	66.6588	66.9169	67.1867 (39)
Average = Sum(39)m / 12 =												66.7858 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0988	1.0964	1.0940	1.0830	1.0809	1.0713	1.0713	1.0695	1.0750	1.0809	1.0851	1.0895 (40)
HLP (average)												1.0830 (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	2.0284 (42)
Average daily hot water use (litres/day)	82.3754 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.6129	87.3179	84.0229	80.7279	77.4328	74.1378	74.1378	77.4328	80.7279	84.0229	87.3179	90.6129 (44)
Energy conte	134.3763	117.5264	121.2767	105.7320	101.4523	87.5457	81.1239	93.0909	94.2027	109.7842	119.8380	130.1363 (45)
Energy content (annual)										Total = Sum(45)m =		1296.0854 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	28.5550	24.9744	25.7713	22.4680	21.5586	18.6035	17.2388	19.7818	20.0181	23.3291	25.4656	27.6540	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1799	14.3708	11.6871	8.8479	6.6139	5.5837	6.0334	7.8425	10.5262	13.3654	15.5994	16.6295	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1382	178.9763	174.3443	164.4832	152.0353	140.3361	132.5203	130.6822	135.3142	145.1753	157.6232	169.3224	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	(71)
Water heating gains (Table 5)	38.3803	37.1642	34.6388	31.2056	28.9766	25.8381	23.1705	26.5885	27.8029	31.3564	35.3689	37.1693	(72)
Total internal gains	285.1250	283.9379	274.0968	257.9633	241.0524	225.1845	215.1508	218.5397	227.0698	243.3236	262.0179	276.5478	(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
Southeast	1.6800	36.7938	0.4600	0.0000	0.7700	21.8944 (77)
Southwest	3.2600	36.7938	0.4600	0.0000	0.7700	42.4855 (79)
Northwest	2.1500	11.2829	0.4600	0.0000	0.7700	8.5923 (81)
Northwest	3.8000	11.2829	0.4300	0.0000	0.7700	14.1960 (81)

Solar gains	87.1682	156.0490	233.6186	323.1647	392.7312	403.4213	383.3106	329.3424	264.3027	177.8884	105.7859	73.7059	(83)
Total gains	372.2932	439.9870	507.7155	581.1280	633.7836	628.6059	598.4613	547.8820	491.3725	421.2120	367.8038	350.2537	(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	37.3811	37.4629	37.5436	37.9269	37.9995	38.3411	38.3411	38.4050	38.2088	37.9995	37.8529	37.7009	
alpha	3.4921	3.4975	3.5029	3.5285	3.5333	3.5561	3.5561	3.5603	3.5473	3.5333	3.5235	3.5134	
util living area	0.9861	0.9745	0.9490	0.8868	0.7707	0.6083	0.4658	0.5214	0.7514	0.9246	0.9767	0.9886	(86)
MIT	19.2563	19.4941	19.8662	20.3294	20.6987	20.9071	20.9726	20.9593	20.7975	20.3038	19.6930	19.2108	(87)
Th 2	20.0018	20.0038	20.0057	20.0148	20.0165	20.0244	20.0244	20.0258	20.0213	20.0165	20.0130	20.0095	(88)
util rest of house	0.9832	0.9694	0.9385	0.8634	0.7246	0.5341	0.3705	0.4233	0.6856	0.9039	0.9711	0.9863	(89)
MIT 2	18.4100	18.6465	19.0129	19.4637	19.7984	19.9724	20.0141	20.0093	19.8936	19.4504	18.8525	18.3706	(90)
Living area fraction									fLA = Living area / (4) =			0.4010	(91)
MIT	18.7494	18.9864	19.3551	19.8108	20.1594	20.3472	20.3985	20.3902	20.2560	19.7926	19.1895	18.7075	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7494	18.9864	19.3551	19.8108	20.1594	20.3472	20.3985	20.3902	20.2560	19.7926	19.1895	18.7075	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9786	0.9627	0.9302	0.8578	0.7318	0.5597	0.4080	0.4613	0.7028	0.8983	0.9651	0.9822	(94)
Ext temp.	364.3077	423.5854	472.2780	498.5181	463.8214	351.8572	244.1903	252.7570	345.3292	378.3600	354.9642	344.0360	(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	979.1131	952.4304	867.3112	728.6948	563.8961	379.6881	250.9451	263.1755	408.1069	612.7695	808.9932	974.7135	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	457.4153	355.3839	293.9047	165.7272	74.4555	0.0000	0.0000	0.0000	0.0000	174.4006	326.9008	469.2241	(98)
												2317.4122	(98)
												37.5776	(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	621.0102	488.8804	501.2575	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8710	0.9180	0.8951	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	540.8847	448.7679	448.6643	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	810.5536	773.8387	715.9561	0.0000	0.0000	0.0000	0.0000	(103)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Month fraction	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	194.1616	241.8527	198.8651	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												634.8794 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.5404	60.4632	49.7163	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												158.7198 (107)
Space cooling per m2												2.5737 (108)
Energy for space heating												37.5776 (99)
Energy for space cooling												2.5737 (108)
Total												40.1513 (109)
Dwelling Fabric Energy Efficiency (DFEE)												40.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6700 (1b)	x 2.3600 (2b)	= 145.5412 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5412 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1374 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3874 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3584 (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	0.4569	0.4480	0.4390	0.3942	0.3852	0.3404	0.3404	0.3315	0.3584	0.3852	0.4032	0.4211 (22b)
Effective ac	0.6044	0.6003	0.5964	0.5777	0.5742	0.5580	0.5580	0.5549	0.5642	0.5742	0.5813	0.5887 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Opening Type (Uw = 1.40)			10.8900	1.3258	14.4375		(27)
100mm Knauf Supafil 34	57.1100	10.8900	46.2200	0.1800	8.3196		(29a)
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450		(29a)
500mm Loft roll	61.6700		61.6700	0.1300	8.0171		(30)
Total net area of external elements Aum, m ²			136.0100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.4992		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.7981 (36)
Total fabric heat loss						(33) + (36) =	42.2973 (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	29.0277	28.8330	28.6422	27.7459	27.5782	26.7976	26.7976	26.6530	27.0983	27.5782	27.9175	28.2721 (38)
Heat transfer coeff	71.3250	71.1303	70.9395	70.0432	69.8755	69.0949	69.0949	68.9503	69.3956	69.8755	70.2148	70.5694 (39)
Average = Sum(39)m / 12 =												70.0424 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1566	1.1534	1.1503	1.1358	1.1331	1.1204	1.1204	1.1181	1.1253	1.1331	1.1386	1.1443 (40)
HLP (average)												1.1358 (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												2.0284 (42)
Average daily hot water use (litres/day)												82.3754 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.6129	87.3179	84.0229	80.7279	77.4328	74.1378	74.1378	77.4328	80.7279	84.0229	87.3179	90.6129 (44)
Energy conte	134.3763	117.5264	121.2767	105.7320	101.4523	87.5457	81.1239	93.0909	94.2027	109.7842	119.8380	130.1363 (45)
Energy content (annual)												Total = Sum(45)m = 1296.0854 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	28.5550	24.9744	25.7713	22.4680	21.5586	18.6035	17.2388	19.7818	20.0181	23.3291	25.4656	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	101.4218	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1799	14.3708	11.6871	8.8479	6.6139	5.5837	6.0334	7.8425	10.5262	13.3654	15.5994	16.6295	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.1382	178.9763	174.3443	164.4832	152.0353	140.3361	132.5203	130.6822	135.3142	145.1753	157.6232	169.3224	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	33.1422	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	(71)
Water heating gains (Table 5)	38.3803	37.1642	34.6388	31.2056	28.9766	25.8381	23.1705	26.5885	27.8029	31.3564	35.3689	37.1693	(72)
Total internal gains	285.1250	283.9379	274.0968	257.9633	241.0524	225.1845	215.1508	218.5397	227.0698	243.3236	262.0179	276.5478	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.6800	36.7938	0.6300	0.7000	0.7700	18.8911	(77)
Southwest	3.2600	36.7938	0.6300	0.7000	0.7700	36.6576	(79)
Northwest	5.9500	11.2829	0.6300	0.7000	0.7700	20.5169	(81)

Solar gains	76.0656	136.3827	204.7062	283.9819	345.7772	355.4583	337.6303	289.6659	231.8661	155.6125	92.3501	64.2932	(83)
Total gains	361.1905	420.3206	478.8031	541.9451	586.8296	580.6428	552.7810	508.2055	458.9359	398.9361	354.3680	340.8410	(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	60.0440	60.2083	60.3703	61.1428	61.2895	61.9820	61.9820	62.1119	61.7134	61.2895	60.9934	60.6869		
alpha	5.0029	5.0139	5.0247	5.0762	5.0860	5.1321	5.1321	5.1408	5.1142	5.0860	5.0662	5.0458		
util living area	0.9982	0.9958	0.9884	0.9601	0.8752	0.7063	0.5382	0.6021	0.8537	0.9781	0.9962	0.9987	(86)	
MIT	19.7366	19.8941	20.1543	20.5004	20.7919	20.9509	20.9900	20.9829	20.8668	20.4859	20.0493	19.7116	(87)	
Th 2	19.9549	19.9575	19.9600	19.9717	19.9739	19.9842	19.9842	19.9861	19.9802	19.9739	19.9695	19.9648	(88)	
util rest of house	0.9976	0.9944	0.9842	0.9449	0.8294	0.6156	0.4200	0.4803	0.7837	0.9670	0.9947	0.9982	(89)	
MIT 2	18.8046	18.9635	19.2235	19.5695	19.8343	19.9619	19.9817	19.9813	19.9062	19.5626	19.1284	18.7875	(90)	
Living area fraction														
MIT	19.1783	19.3367	19.5968	19.9428	20.2183	20.3585	20.3860	20.3829	20.2914	19.9329	19.4977	19.1581	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.1783	19.3367	19.5968	19.9428	20.2183	20.3585	20.3860	20.3829	20.2914	19.9329	19.4977	19.1581	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	360.1040	417.4901	470.3488	511.8135	493.8525	377.9161	258.6025	269.1655	370.6761	385.5431	352.1453	340.0710	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	1061.1982	1026.8868	929.0790	773.4755	595.2179	397.8822	261.5957	274.6234	429.6572	652.1404	870.5014	1055.5816	(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	521.6141	409.5146	341.2953	188.3966	75.4159	0.0000	0.0000	0.0000	0.0000	198.3484	373.2164	532.3399	(98)	
Space heating												2640.1412	(98)	
Space heating per m2												42.8108	(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	649.4921	511.3023	524.0226	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8927	0.9431	0.9208	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	579.7987	482.2093	482.4953	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	754.4928	720.4461	669.5810	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	125.7798	177.2482	139.1918	0.0000	0.0000	0.0000	0.0000	(104)	
Space cooling												442.2198	(104)	
Cooled fraction												1.0000	(105)	

$$fC = \text{cooled area} / (4) =$$

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	31.4449	44.3121	34.7979	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											110.5549 (107)
Space cooling per m2											1.7927 (108)
Energy for space heating											42.8108 (99)
Energy for space cooling											1.7927 (108)
Total											44.6035 (109)
Target Fabric Energy Efficiency (TFEE)											51.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6700 (1b)	x 2.3600 (2b)	= 145.5412 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5412 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
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							4.0100					
Infiltration rate							0.2005		(18)			
Number of sides sheltered							1		(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1855	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.1947	0.1855	0.1855	0.1716	0.1716	0.1530	0.1576	0.1484	0.1530	0.1623	0.1623	0.1762 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			1.9800	1.0000	1.9800		(26)	
Window (Uw = 1.20)			7.0900	1.1450	8.1183		(27)	
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)	
100mm Knauf Supafil 34	57.1100	10.8900	46.2200	0.2500	11.5550	52.8000	2440.4160 (29a)	
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)	
500mm Loft roll	61.6700		61.6700	0.0900	5.5503	9.0000	555.0300 (30)	
Total net area of external elements Aum(A, m2)			136.0100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	34.9865				(33)
E-FC-4			61.6700					70.0000 (32d)
Timber partition			111.2500					9.0000 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	9118.7960 (34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				147.8644 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.9466 (36)				
Total fabric heat loss			(33) + (36) =	39.9331 (37)				

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

(38)m	Jan 24.0143	Feb 24.0143	Mar 24.0143	Apr 24.0143	May 24.0143	Jun 24.0143	Jul 24.0143	Aug 24.0143	Sep 24.0143	Oct 24.0143	Nov 24.0143	Dec 24.0143 (38)
Heat transfer coeff	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474 (39)
Average = Sum(39)m / 12 =												63.9474 (39)
HLP	Jan 1.0369	Feb 1.0369	Mar 1.0369	Apr 1.0369	May 1.0369	Jun 1.0369	Jul 1.0369	Aug 1.0369	Sep 1.0369	Oct 1.0369	Nov 1.0369	Dec 1.0369 (40)
HLP (average)												1.0369 (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												2.0284 (42)
Average daily hot water use (litres/day)												82.3754 (43)
Daily hot water use	Jan 90.6129	Feb 87.3179	Mar 84.0229	Apr 80.7279	May 77.4328	Jun 74.1378	Jul 74.1378	Aug 77.4328	Sep 80.7279	Oct 84.0229	Nov 87.3179	Dec 90.6129 (44)
Energy conte	134.3763	117.5264	121.2767	105.7320	101.4523	87.5457	81.1239	93.0909	94.2027	109.7842	119.8380	130.1363 (45)
Energy content (annual)												Total = Sum(45)m = 1296.0854 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	20.1564	17.6290	18.1915	15.8598	15.2179	13.1318	12.1686	13.9636	14.1304	16.4676	17.9757	19.5204 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8424 (55)
Total storage loss												
26.1144 23.5872 26.1144 25.2720 26.1144 25.2720 26.1144 26.1144 25.2720 26.1144 25.2720 26.1144 (56)												
If cylinder contains dedicated solar storage												
26.1144 23.5872 26.1144 25.2720 26.1144 25.2720 26.1144 26.1144 25.2720 26.1144 25.2720 26.1144 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
183.7531 162.1248 170.6535 153.5160 150.8291 135.3297 130.5007 142.4677 141.9867 159.1610 167.6220 179.5131 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	183.7531	162.1248	170.6535	153.5160	150.8291	135.3297	130.5007	142.4677	141.9867	159.1610	167.6220	179.5131 (64)
RHI water heating demand												Total per year (kWh/year) = Sum(64)m = 1877.4574 (64)
Heat gains from water heating, kWh/month	84.1816	74.7562	79.8259	73.3831	73.2343	67.3361	66.4751	70.4542	69.5496	76.0047	78.0733	82.7718 (65)

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

Metabolic gains (Table 5), Watts												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
(66)m 121.7062 121.7062 121.7062 121.7062 121.7062 121.7062 121.7062 121.7062 121.7062 121.7062 121.7062 121.7062 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
40.4496 35.9270 29.2178 22.1198 16.5348 13.9594 15.0836 19.6062 26.3154 33.4135 38.9984 41.5739 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
264.3854 267.1289 260.2154 245.4973 226.9184 209.4569 197.7915 195.0480 201.9615 216.6796 235.2585 252.7200 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
49.1991 49.1991 49.1991 49.1991 49.1991 49.1991 49.1991 49.1991 49.1991 49.1991 49.1991 49.1991 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-81.1375 -81.1375 -81.1375 -81.1375 -81.1375 -81.1375 -81.1375 -81.1375 -81.1375 -81.1375 -81.1375 -81.1375 (71)												
Water heating gains (Table 5)												
113.1473 111.2444 107.2929 101.9209 98.4333 93.5224 89.3483 94.6965 96.5967 102.1568 108.4352 111.2524 (72)												
Total internal gains	507.7501	504.0681	486.4939	459.3058	431.6542	406.7064	391.9912	399.1184	414.6414	442.0176	472.4599	495.3140 (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												
Southeast												24.0819 (77)
Southwest												46.7303 (79)
Northwest												9.8417 (81)
Northwest												16.2602 (81)
Solar gains	96.9140	156.5697	232.7408	333.5948	396.1195	435.7949	409.4727	359.0777	286.0764	190.9120	120.5818	81.1014 (83)
Total gains	604.6641	660.6378	719.2347	792.9006	827.7738	842.5013	801.4638	758.1962	700.7178	632.9297	593.0417	576.4154 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107
alpha	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407
util living area	0.9329	0.9087	0.8521	0.7392	0.5722	0.3725	0.2462	0.2682	0.5034	0.7638	0.8941	0.9409 (86)
Tweekday	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260
Tweekend	20.3211	20.4234	20.6148	20.8144	20.9431	20.9912	20.9986	20.9981	20.9727	20.8236	20.5485	20.2885
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	19.9522	20.1081	20.4056	20.7102	20.9121	20.9864	20.9979	20.9971	20.9574	20.7277	20.2949	19.9019 (87)
Th 2	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527 (88)
util rest of house												
0.9213 0.8936 0.8281 0.7003 0.5159 0.3047 0.1715 0.1896 0.4298 0.7188 0.8738 0.9304 (89)												
Tweekday	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260
Tweekend	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260
MIT 2	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260 (90)
Living area fraction												
fLA = Living area / (4) =												0.4010 (91)
MIT	19.2001	19.3954	19.7597	20.1251	20.3486	20.4221	20.4313	20.4308	20.3969	20.1492	19.6358	19.1377 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2001	19.3954	19.7597	20.1251	20.3486	20.4221	20.4313	20.4308	20.3969	20.1492	19.6358	19.1377 (93)

8. Space heating requirement

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
Utilisation	0.9088	0.8814	0.8199	0.7034	0.5340	0.3314	0.2015	0.2212	0.4572	0.7238	0.8635	0.9182 (94)
Useful gains	549.5326	582.2678	589.6883	557.7566	442.0512	279.2296	161.4891	167.6882	320.3993	458.0992	512.0981	529.2586 (95)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	901.6641	882.1796	790.3696	653.8671	469.9256	282.7816	161.8713	168.2337	332.3304	546.7006	744.0825	897.6730 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	261.9859	201.5407	149.3069	69.1995	20.7385	0.0000	0.0000	0.0000	0.0000	65.9194	167.0287	274.1003 (98)
Space heating												1209.8200 (98)
RHI space heating demand												1210 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6700 (1b)	x 2.3600 (2b)	= 145.5412 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5412 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
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							4.0100					
Infiltration rate							0.2005	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1855	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2365	0.2318	0.2272	0.2040	0.1994	0.1762	0.1762	0.1716	0.1855	0.1994	0.2086	0.2179 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K		
Solid Door			1.9800	1.0000	1.9800			(26)	
Window (Uw = 1.20)			7.0900	1.1450	8.1183			(27)	
French Door (Uw = 1.40)			3.8000	1.3258	5.0379			(27)	
100mm Knauf Supafil 34	57.1100	10.8900	46.2200	0.2500	11.5550	52.8000	2440.4160	(29a)	
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000	(29a)	
500mm Loft roll	61.6700		61.6700	0.0900	5.5503	9.0000	555.0300	(30)	
Total net area of external elements Aum(A, m2)			136.0100						(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9865			(33)	
E-FC-4			61.6700			70.0000	4316.9000	(32d)	
Timber partition			111.2500			9.0000	1001.2500	(32c)	
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				9118.7960	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							147.8644	(35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.9466	(36)	
Total fabric heat loss			(33) + (36) =				39.9331	(37)	

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

(38)m	Jan 24.0143	Feb 24.0143	Mar 24.0143	Apr 24.0143	May 24.0143	Jun 24.0143	Jul 24.0143	Aug 24.0143	Sep 24.0143	Oct 24.0143	Nov 24.0143	Dec 24.0143 (38)
Heat transfer coeff	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474 (39)
Average = Sum(39)m / 12 =												63.9474 (39)
HLP	Jan 1.0369	Feb 1.0369	Mar 1.0369	Apr 1.0369	May 1.0369	Jun 1.0369	Jul 1.0369	Aug 1.0369	Sep 1.0369	Oct 1.0369	Nov 1.0369	Dec 1.0369 (40)
HLP (average)												1.0369 (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												2.0284 (42)
Average daily hot water use (litres/day)												82.3754 (43)
Daily hot water use	Jan 90.6129	Feb 87.3179	Mar 84.0229	Apr 80.7279	May 77.4328	Jun 74.1378	Jul 74.1378	Aug 77.4328	Sep 80.7279	Oct 84.0229	Nov 87.3179	Dec 90.6129 (44)
Energy conte	134.3763	117.5264	121.2767	105.7320	101.4523	87.5457	81.1239	93.0909	94.2027	109.7842	119.8380	130.1363 (45)
Energy content (annual)												Total = Sum(45)m = 1296.0854 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	20.1564	17.6290	18.1915	15.8598	15.2179	13.1318	12.1686	13.9636	14.1304	16.4676	17.9757	19.5204 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8424 (55)
Total storage loss												
26.1144 23.5872 26.1144 25.2720 26.1144 25.2720 26.1144 26.1144 25.2720 26.1144 25.2720 26.1144 (56)												
If cylinder contains dedicated solar storage												
26.1144 23.5872 26.1144 25.2720 26.1144 25.2720 26.1144 26.1144 25.2720 26.1144 25.2720 26.1144 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
183.7531 162.1248 170.6535 153.5160 150.8291 135.3297 130.5007 142.4677 141.9867 159.1610 167.6220 179.5131 (62)												
WWHRS	-42.1034	-37.0404	-37.8074	-31.1420	-28.9342	-23.8821	-20.2356	-24.4927	-25.1967	-31.1230	-36.0172	-40.6870 eq. (G10)
Total of WWHRS savings												-378.6615
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	141.6498	125.0844	132.8462	122.3740	121.8949	111.4475	110.2652	117.9750	116.7900	128.0380	131.6048	138.8261 (64)
Total per year (kWh/year) = Sum(64)m =												1498.7958 (64)
Heat gains from water heating, kWh/month												
84.1816 74.7562 79.8259 73.3831 73.2343 67.3361 66.4751 70.4542 69.5496 76.0047 78.0733 82.7718 (65)												

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.4496	35.9270	29.2178	22.1198	16.5348	13.9594	15.0836	19.6062	26.3154	33.4135	38.9984	41.5739 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.3854	267.1289	260.2154	245.4973	226.9184	209.4569	197.7915	195.0480	201.9615	216.6796	235.2585	252.7200 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375 (71)
Water heating gains (Table 5)	113.1473	111.2444	107.2929	101.9209	98.4333	93.5224	89.3483	94.6965	96.5967	102.1568	108.4352	111.2524 (72)
Total internal gains	507.7501	504.0681	486.4939	459.3058	431.6542	406.7064	391.9912	399.1184	414.6414	442.0176	472.4599	495.3140 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	1.6800	36.7938	0.4600	0.0000	0.7700	21.8944 (77)
Southwest	3.2600	36.7938	0.4600	0.0000	0.7700	42.4855 (79)
Northwest	2.1500	11.2829	0.4600	0.0000	0.7700	8.5923 (81)
Northwest	3.8000	11.2829	0.4300	0.0000	0.7700	14.1960 (81)

Solar gains	87.1682	156.0490	233.6186	323.1647	392.7312	403.4213	383.3106	329.3424	264.3027	177.8884	105.7859	73.7059 (83)
Total gains	594.9183	660.1171	720.1125	782.4706	824.3854	810.1278	775.3018	728.4608	678.9441	619.9060	578.2457	569.0199 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107
alpha	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407
util living area	0.9436	0.9185	0.8711	0.7801	0.6430	0.4835	0.3571	0.3948	0.5951	0.8112	0.9155	0.9509 (86)
Tweekday	18.5181	18.7906	19.1892	19.6148	19.9008	20.0207	20.0471	20.0441	19.9785	19.6302	19.0055	18.4303
Tweekend	20.2403	20.3653	20.5502	20.7550	20.9030	20.9736	20.9932	20.9902	20.9442	20.7568	20.4608	20.2003
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	19.8276	20.0181	20.3058	20.6175	20.8503	20.9595	20.9895	20.9848	20.9129	20.6246	20.1581	19.7658 (87)
Th 2	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527 (88)
util rest of house	0.9341	0.9052	0.8506	0.7468	0.5937	0.4188	0.2827	0.3172	0.5285	0.7745	0.8994	0.9425 (89)
Tweekday	18.5181	18.7906	19.1892	19.6148	19.9008	20.0207	20.0471	20.0441	19.9785	19.6302	19.0055	18.4303
Tweekend	18.5181	18.7906	19.1892	19.6148	19.9008	20.0207	20.0471	20.0441	19.9785	19.6302	19.0055	18.4303
MIT 2	18.5181	18.7906	19.1892	19.6148	19.9008	20.0207	20.0471	20.0441	19.9785	19.6302	19.0055	18.4303 (90)
Living area fraction									fLA = Living area / (4) =			0.4010 (91)
MIT	19.0432	19.2829	19.6370	20.0169	20.2816	20.3971	20.4250	20.4213	20.3532	20.0289	19.4677	18.9659 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0432	19.2829	19.6370	20.0169	20.2816	20.3971	20.4250	20.4213	20.3532	20.0289	19.4677	18.9659 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9217	0.8926	0.8405	0.7454	0.6061	0.4428	0.3122	0.3478	0.5504	0.7735	0.8878	0.9305 (94)

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Useful gains	548.3566	589.2001	605.2397	583.2613	499.6393	358.7178	242.0784	253.3662	373.7119	479.5041	513.3570	529.4784 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
Month fracti	942.7891	919.7475	840.0757	710.8957	548.7685	370.7120	244.6011	257.1522	399.8747	602.9563	790.8815	944.2387 (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	293.4578	222.1279	174.7180	91.8967	36.5521	0.0000	0.0000	0.0000	0.0000	91.8484	199.8177	308.5817 (98)
Space heating per m2											(98) / (4) =	23.0096 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												197.4448 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												718.6822 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	293.4578	222.1279	174.7180	91.8967	36.5521	0.0000	0.0000	0.0000	0.0000	91.8484	199.8177	308.5817 (98)
Space heating efficiency (main heating system 1)	197.4448	197.4448	197.4448	197.4448	197.4448	0.0000	0.0000	0.0000	0.0000	197.4448	197.4448	197.4448 (210)
Space heating fuel (main heating system)	148.6278	112.5013	88.4896	46.5430	18.5126	0.0000	0.0000	0.0000	0.0000	46.5185	101.2018	156.2876 (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	141.6498	125.0844	132.8462	122.3740	121.8949	111.4475	110.2652	117.9750	116.7900	128.0380	131.6048	138.8261 (64)
Efficiency of water heater	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (216)
Fuel for water heating, kWh/month	83.1864	73.4581	78.0163	71.8663	71.5850	65.4496	64.7552	69.2829	68.5870	75.1926	77.2873	81.5281 (219)
Water heating fuel used												880.1949 (219)
Annual totals kWh/year												
Space heating fuel - main system												718.6822 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.7450, total flow = 21.0000, SFP = 0.2260)												
mechanical ventilation fans (SFP = 0.2260)												40.1202 (230a)
Total electricity for the above, kWh/year												40.1202 (231)
Electricity for lighting (calculated in Appendix L)												285.7414 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.20 * 1029 * 1.00) =									-988.0192			-988.0192 (233)
Total delivered energy for all uses												936.7193 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	718.6822	13.1900	94.7942 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	880.1949	13.1900	116.0977 (247)
Mechanical ventilation fans	40.1202	13.1900	5.2918 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	285.7414	13.1900	37.6893 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-988.0192	13.1900	-130.3197 (252)
Total energy cost			123.5533 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		0.4865 (257)
SAP rating (Section 12)		93.2137
SAP band		93 (258)
		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	718.6822	0.5190	372.9961 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	880.1949	0.5190	456.8211 (264)
Space and water heating			829.8172 (265)
Pumps and fans	40.1202	0.5190	20.8224 (267)

FULL SAP CALCULATION PRINTOUT

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Energy for lighting	285.7414	0.5190	148.2998 (268)
Energy saving/generation technologies			
PV Unit	-988.0192	0.5190	-512.7820 (269)
Total kg/year			486.1573 (272)
CO2 emissions per m2			7.8800 (273)
EI value			93.8928
EI rating			94 (274)
EI band			A

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

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.00) / 1.9744 = 6.680$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.00) / 1.9744 = 0.2629$, stars = 4
Water heating energy efficiency	$13.19 / 1.7028 = 7.746$, stars = 3
Water heating environmental impact	$0.519 / 1.7028 = 0.3048$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.6700 (1b)	x 2.3600 (2b)	= 145.5412 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.5412 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
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							4.0100					
Infiltration rate							0.2005		(18)			
Number of sides sheltered							1		(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1855	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.1947	0.1855	0.1855	0.1716	0.1716	0.1530	0.1576	0.1484	0.1530	0.1623	0.1623	0.1762 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Solid Door			1.9800	1.0000	1.9800		(26)	
Window (Uw = 1.20)			7.0900	1.1450	8.1183		(27)	
French Door (Uw = 1.40)			3.8000	1.3258	5.0379		(27)	
100mm Knauf Supafil 34	57.1100	10.8900	46.2200	0.2500	11.5550	52.8000	2440.4160 (29a)	
E-WM-30 WTS	17.2300	1.9800	15.2500	0.1800	2.7450	52.8000	805.2000 (29a)	
500mm Loft roll	61.6700		61.6700	0.0900	5.5503	9.0000	555.0300 (30)	
Total net area of external elements Aum(A, m ²)			136.0100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	34.9865				(33)
E-FC-4			61.6700					70.0000 (32d)
Timber partition			111.2500					9.0000 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	9118.7960 (34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							147.8644 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.9466 (36)	
Total fabric heat loss			(33) + (36) =				39.9331 (37)	

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

(38)m	Jan 24.0143	Feb 24.0143	Mar 24.0143	Apr 24.0143	May 24.0143	Jun 24.0143	Jul 24.0143	Aug 24.0143	Sep 24.0143	Oct 24.0143	Nov 24.0143	Dec 24.0143 (38)
Heat transfer coeff	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474	63.9474 (39)
Average = Sum(39)m / 12 =												63.9474 (39)
HLP	Jan 1.0369	Feb 1.0369	Mar 1.0369	Apr 1.0369	May 1.0369	Jun 1.0369	Jul 1.0369	Aug 1.0369	Sep 1.0369	Oct 1.0369	Nov 1.0369	Dec 1.0369 (40)
HLP (average)												1.0369 (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												2.0284 (42)
Average daily hot water use (litres/day)												82.3754 (43)
Daily hot water use	Jan 90.6129	Feb 87.3179	Mar 84.0229	Apr 80.7279	May 77.4328	Jun 74.1378	Jul 74.1378	Aug 77.4328	Sep 80.7279	Oct 84.0229	Nov 87.3179	Dec 90.6129 (44)
Energy conte	134.3763	117.5264	121.2767	105.7320	101.4523	87.5457	81.1239	93.0909	94.2027	109.7842	119.8380	130.1363 (45)
Energy content (annual)												Total = Sum(45)m = 1296.0854 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	20.1564	17.6290	18.1915	15.8598	15.2179	13.1318	12.1686	13.9636	14.1304	16.4676	17.9757	19.5204 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8424 (55)
Total storage loss												
26.1144 23.5872 26.1144 25.2720 26.1144 25.2720 26.1144 26.1144 25.2720 26.1144 25.2720 26.1144 (56)												
If cylinder contains dedicated solar storage												
26.1144 23.5872 26.1144 25.2720 26.1144 25.2720 26.1144 26.1144 25.2720 26.1144 25.2720 26.1144 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
183.7531 162.1248 170.6535 153.5160 150.8291 135.3297 130.5007 142.4677 141.9867 159.1610 167.6220 179.5131 (62)												
WWHRS	-42.1034	-37.0404	-37.8074	-31.1420	-28.9342	-23.8821	-20.2356	-24.4927	-25.1967	-31.1230	-36.0172	-40.6870 eq. (G10)
Total of WWHRS savings												-378.6615
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	141.6498	125.0844	132.8462	122.3740	121.8949	111.4475	110.2652	117.9750	116.7900	128.0380	131.6048	138.8261 (64)
Total per year (kWh/year) = Sum(64)m =												1498.7958 (64)
Heat gains from water heating, kWh/month												
84.1816 74.7562 79.8259 73.3831 73.2343 67.3361 66.4751 70.4542 69.5496 76.0047 78.0733 82.7718 (65)												

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062	121.7062 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.4496	35.9270	29.2178	22.1198	16.5348	13.9594	15.0836	19.6062	26.3154	33.4135	38.9984	41.5739 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.3854	267.1289	260.2154	245.4973	226.9184	209.4569	197.7915	195.0480	201.9615	216.6796	235.2585	252.7200 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991	49.1991 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375	-81.1375 (71)
Water heating gains (Table 5)	113.1473	111.2444	107.2929	101.9209	98.4333	93.5224	89.3483	94.6965	96.5967	102.1568	108.4352	111.2524 (72)
Total internal gains	507.7501	504.0681	486.4939	459.3058	431.6542	406.7064	391.9912	399.1184	414.6414	442.0176	472.4599	495.3140 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				1.6800	40.4699	0.4600	0.0000	0.7700	24.0819 (77)			
Southwest				3.2600	40.4699	0.4600	0.0000	0.7700	46.7303 (79)			
Northwest				2.1500	12.9236	0.4600	0.0000	0.7700	9.8417 (81)			
Northwest				3.8000	12.9236	0.4300	0.0000	0.7700	16.2602 (81)			
Solar gains	96.9140	156.5697	232.7408	333.5948	396.1195	435.7949	409.4727	286.0764	190.9120	120.5818	81.1014 (83)	
Total gains	604.6641	660.6378	719.2347	792.9006	827.7738	842.5013	801.4638	758.1962	700.7178	632.9297	593.0417	576.4154 (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	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107	39.6107
alpha	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407	3.6407
util living area	0.9329	0.9087	0.8521	0.7392	0.5722	0.3725	0.2462	0.2682	0.5034	0.7638	0.8941	0.9409 (86)
Tweekday	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260
Tweekend	20.3211	20.4234	20.6148	20.8144	20.9431	20.9912	20.9986	20.9981	20.9727	20.8236	20.5485	20.2885
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	19.9522	20.1081	20.4056	20.7102	20.9121	20.9864	20.9979	20.9971	20.9574	20.7277	20.2949	19.9019 (87)
Th 2	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527	20.0527 (88)
util rest of house	0.9213	0.8936	0.8281	0.7003	0.5159	0.3047	0.1715	0.1896	0.4298	0.7188	0.8738	0.9304 (89)
Tweekday	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260
Tweekend	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260
MIT 2	18.6966	18.9182	19.3273	19.7333	19.9714	20.0443	20.0520	20.0517	20.0217	19.7620	19.1946	18.6260 (90)
Living area fraction									fLA = Living area / (4) =			0.4010 (91)
MIT	19.2001	19.3954	19.7597	20.1251	20.3486	20.4221	20.4313	20.4308	20.3969	20.1492	19.6358	19.1377 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2001	19.3954	19.7597	20.1251	20.3486	20.4221	20.4313	20.4308	20.3969	20.1492	19.6358	19.1377 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9088	0.8814	0.8199	0.7034	0.5340	0.3314	0.2015	0.2212	0.4572	0.7238	0.8635	0.9182 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Useful gains	549.5326	582.2678	589.6883	557.7566	442.0512	279.2296	161.4891	167.6882	320.3993	458.0992	512.0981	529.2586 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W												
Month fracti	901.6641	882.1796	790.3696	653.8671	469.9256	282.7816	161.8713	168.2337	332.3304	546.7006	744.0825	897.6730 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	261.9859	201.5407	149.3069	69.1995	20.7385	0.0000	0.0000	0.0000	0.0000	65.9194	167.0287	274.1003 (98)
Space heating per m2											(98) / (4) =	19.6176 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												197.4448 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												612.7385 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	261.9859	201.5407	149.3069	69.1995	20.7385	0.0000	0.0000	0.0000	0.0000	65.9194	167.0287	274.1003 (98)
Space heating efficiency (main heating system 1)	197.4448	197.4448	197.4448	197.4448	197.4448	0.0000	0.0000	0.0000	0.0000	197.4448	197.4448	197.4448 (210)
Space heating fuel (main heating system)	132.6882	102.0745	75.6196	35.0475	10.5035	0.0000	0.0000	0.0000	0.0000	33.3863	84.5952	138.8238 (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	141.6498	125.0844	132.8462	122.3740	121.8949	111.4475	110.2652	117.9750	116.7900	128.0380	131.6048	138.8261 (64)
Efficiency of water heater	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (216)
(217)m	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800	170.2800 (217)
Fuel for water heating, kWh/month	83.1864	73.4581	78.0163	71.8663	71.5850	65.4496	64.7552	69.2829	68.5870	75.1926	77.2873	81.5281 (219)
Water heating fuel used												880.1949 (219)
Annual totals kWh/year												612.7385 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.7450, total flow = 21.0000, SFP = 0.2260)												
mechanical ventilation fans (SFP = 0.2260)												40.1202 (230a)
Total electricity for the above, kWh/year												40.1202 (231)
Electricity for lighting (calculated in Appendix L)												285.7414 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.20 * 1090 * 1.00) =										-1046.8728		-1046.8728 (233)
Total delivered energy for all uses												771.9221 (238)

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

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	612.7385	16.9600	103.9205 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	880.1949	16.9600	149.2810 (247)
Mechanical ventilation fans	40.1202	16.9600	6.8044 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	285.7414	16.9600	48.4617 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-1046.8728	16.9600	-177.5496 (252)
Total energy cost			130.9180 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	612.7385	0.5190	318.0113 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	880.1949	0.5190	456.8211 (264)
Space and water heating			774.8324 (265)
Pumps and fans	40.1202	0.5190	20.8224 (267)
Energy for lighting	285.7414	0.5190	148.2998 (268)
Energy saving/generation technologies			
PV Unit	-1046.8728	0.5190	-543.3270 (269)
Total kg/year			400.6276 (272)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	612.7385	3.0700	1881.1072 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	880.1949	3.0700	2702.1982 (264)
Space and water heating			4583.3055 (265)
Pumps and fans	40.1202	3.0700	123.1689 (267)
Energy for lighting	285.7414	3.0700	877.2260 (268)
Energy saving/generation technologies			
PV Unit	-1046.8728	3.0700	-3213.8994 (269)
Primary energy kWh/year			2369.8010 (272)
Primary energy kWh/m2/year			38.4271 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

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

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

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

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

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

	Current £308	Potential £308	Saving £0
Electricity			
Space heating	£111	£111	£0
Water heating	£149	£149	£0
Lighting	£48	£48	£0
Generated (PV)	-£178	-£178	£0
Total cost of fuels	£130	£130	£0
Total cost of uses	£130	£130	£0
Delivered energy	13 kWh/m²	13 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	38 kWh/m²	38 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	Detached Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	147.9 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	288.17 (P1)
Transmission heat loss coefficient	39.93 (37)
Summer heat loss coefficient	328.10 (P2)

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

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

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South East	1.6800	119.9223	0.4600	0.0000	0.9000	83.4084
South West	3.2600	119.9223	0.4600	0.0000	0.9000	161.8520
North West	2.1500	98.8453	0.4600	0.0000	0.9000	87.9822
North West	3.8000	98.8453	0.4300	0.0000	0.9000	145.3619
total:						478.6044

Solar gains	Jun	Jul	Aug	(P3/P4)
Internal gains	509	479	420	
Total summer gains	407	392	399	
	916	871	819	(P5)
Summer gain/loss ratio	2.79	2.65	2.50	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 147.9)	0.96	0.96	0.96	
Threshold temperature	19.76	21.52	21.26	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			