

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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Property Reference	MB Baseline plot 2				Issued on Date	24/01/2022
Assessment Reference	Baseline		Prop Type Ref			
Property	Manor Barn, 2, Ecclesden lane, Angmering, BN16 4DQ					
SAP Rating	81 B	DER	20.95	TER	21.17	
Environmental	81 B	% DER<TER	1.04			
CO ₂ Emissions (t/year)	2.09	DPEE	69.84	TFEE	77.91	
General Requirements Compliance	Pass	% DPEE<TFEE	10.36			
Assessor Details				Assessor ID	M057-0001	
Client						

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

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DWELLING AS DESIGNED

Semi-Detached House, total floor area 119 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.17 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.95 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)77.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)69.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.30 (max. 2.00)	1.30 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Ideal LOGIC+ HEAT H24

Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.74 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

Boiler interlock

Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England): Medium OK

Based on:

Overshading: Average
Windows facing North: 11.46 m², No overhang
Windows facing East: 18.54 m², No overhang
Windows facing South: 2.10 m², No overhang
Windows facing West: 29.09 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.00 W/m²K

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.0000 (1b)	x 3.2000 (2b)	= 227.2000 (1b) - (3b)
First floor	48.0000 (1c)	x 2.6000 (2c)	= 124.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	119.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 352.0000 (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					5 * 10 = 50.0000 (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)					50.0000 / (5) = 0.1420 (8)
Pressure test					Yes
Measured/design AP50					4.0000
Infiltration rate					0.3420 (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) =	0.3164 (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	0.4034	0.3955	0.3876	0.3480	0.3401	0.3006	0.3006	0.2927	0.3164	0.3401	0.3559	0.3718 (22b)
Effective ac	0.5814	0.5782	0.5751	0.5606	0.5578	0.5452	0.5452	0.5428	0.5501	0.5578	0.5633	0.5691 (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
Opening 1 Windows (Uw = 1.30)			17.7600	1.2357	21.9468		(27)
Opening 2 Glazed Door (Uw = 1.30)			43.4300	1.2357	53.6683		(27)
Heat Loss Floor 1			74.0000	0.1800	13.3200		(28a)
External Wall 1	164.0000	61.1900	102.8100	0.1800	18.5058		(29a)
External Wall 2	36.0000		36.0000	0.0000	0.0000		(29a)
External Roof 1 Main	71.0000		71.0000	0.1800	12.7800		(30)
Total net area of external elements Aum(A, m ²)			309.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	120.2208		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							27.6182 (36)
Total fabric heat loss						(33) + (36) =	147.8390 (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	67.5314	67.1644	66.8047	65.1150	64.7988	63.3272	63.3272	63.0546	63.8940	64.7988	65.4384	66.1070 (38)
Heat transfer coeff	215.3705	215.0035	214.6437	212.9540	212.6379	211.1662	211.1662	210.8937	211.7331	212.6379	213.2774	213.9460 (39)
Average = Sum(39)m / 12 =												212.9525 (39)
HLP	1.8098	1.8068	1.8037	1.7895	1.7869	1.7745	1.7745	1.7722	1.7793	1.7869	1.7922	1.7979 (40)
HLP (average)												1.7895 (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												2.8594 (42)
Average daily hot water use (litres/day)												102.1100 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	112.3210	108.2366	104.1522	100.0678	95.9834	91.8990	91.8990	95.9834	100.0678	104.1522	108.2366	112.3210 (44)
Energy content (annual)	166.5687	145.6821	150.3308	131.0621	125.7572	108.5189	100.5587	115.3926	116.7707	136.0850	148.5475	161.3129 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1606.5872 (45)
Water storage loss:	24.9853	21.8523	22.5496	19.6593	18.8636	16.2778	15.0838	17.3089	17.5156	20.4128	22.2821	24.1969 (46)
Store volume												200.0000 (47)
b) If manufacturer declared loss factor is not known :												

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Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0103 (51)
Volume factor from Table 2a												0.8434 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9372 (55)
Total storage loss	29.0527	26.2411	29.0527	28.1155	29.0527	28.1155	29.0527	29.0527	28.1155	29.0527	28.1155	29.0527 (56)
If cylinder contains dedicated solar storage	29.0527	26.2411	29.0527	28.1155	29.0527	28.1155	29.0527	29.0527	28.1155	29.0527	28.1155	29.0527 (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	218.8838	192.9344	202.6459	181.6896	178.0723	159.1464	152.8738	167.7077	167.3982	188.4001	199.1750	213.6280 (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	218.8838	192.9344	202.6459	181.6896	178.0723	159.1464	152.8738	167.7077	167.3982	188.4001	199.1750	213.6280 (64)
Heat gains from water heating, kWh/month	97.2362	86.2412	91.8371	84.0801	83.6663	76.5845	75.2878	80.2201	79.3283	87.1003	89.8940	95.4886 (65)
Total per year (kWh/year) = Sum(64)m =												2222.5552 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	25.3104	22.4805	18.2823	13.8409	10.3462	8.7347	9.4382	12.2681	16.4662	20.9077	24.4023	26.0138 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	283.9056	286.8516	279.4277	263.6229	243.6723	224.9216	212.3949	209.4488	216.8728	232.6775	252.6281	271.3789 (68)
Pumps, fans	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747 (71)
Total internal gains	130.6938	128.3351	123.4369	116.7780	112.4547	106.3674	101.1933	107.8227	110.1782	117.0704	124.8528	128.3449 (72)
	508.8002	506.5576	490.0374	463.1323	435.3638	408.9142	391.9169	398.4302	412.4077	439.5460	470.7738	494.6282 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.1000	10.6334	0.7600	0.7000	0.7700	8.2326 (74)
East	7.2600	19.6403	0.7600	0.7000	0.7700	52.5689 (76)
South	2.1000	46.7521	0.7600	0.7000	0.7700	36.1964 (78)
West	6.3000	19.6403	0.7600	0.7000	0.7700	45.6176 (80)
North	9.3600	10.6334	0.7600	0.7000	0.7700	36.6938 (74)
East	11.2800	19.6403	0.7600	0.7000	0.7700	81.6773 (76)
West	22.7900	19.6403	0.7600	0.7000	0.7700	165.0200 (80)

Solar gains	426.0065	819.8027	1332.4825	1940.1263	2390.5236	2456.4633	2334.5721	1994.0402	1546.5208	966.6883	528.3570	352.3455 (83)
Total gains	934.8067	1326.3604	1822.5199	2403.2586	2825.8874	2865.3775	2726.4890	2392.4704	1958.9285	1406.2343	999.1308	846.9736 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	15.3482	15.3744	15.4002	15.5224	15.5455	15.6538	15.6538	15.6740	15.6119	15.5455	15.4989	15.4504
util living area	2.0232	2.0250	2.0267	2.0348	2.0364	2.0436	2.0436	2.0449	2.0408	2.0364	2.0333	2.0300
	0.9507	0.9064	0.8253	0.6936	0.5463	0.4119	0.3149	0.3648	0.5692	0.8061	0.9246	0.9588 (86)
MIT	18.3874	18.7967	19.3926	20.0305	20.4693	20.7113	20.8044	20.7797	20.5498	19.8752	18.9897	18.3109 (87)
Th 2	19.4631	19.4653	19.4674	19.4773	19.4792	19.4879	19.4879	19.4895	19.4845	19.4792	19.4754	19.4715 (88)
util rest of house	0.9419	0.8907	0.7974	0.6485	0.4838	0.3303	0.2154	0.2582	0.4821	0.7631	0.9090	0.9514 (89)
MIT 2	16.1010	16.6790	17.5049	18.3588	18.9050	19.1832	19.2684	19.2548	19.0324	18.1978	16.9706	15.9959 (90)
Living area fraction	17.5266	17.9995	18.6820	19.4012	19.8804	20.1360	20.2262	20.2056	19.9785	19.2437	18.2296	17.4394 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3766	17.8495	18.5320	19.2512	19.7304	19.9860	20.0762	20.0556	19.8285	19.0937	18.0796	17.2894 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9256	0.8695	0.7772	0.6411	0.4948	0.3584	0.2555	0.3000	0.5036	0.7501	0.8903	0.9368 (94)
Ext temp.	865.2608	1153.2649	1416.5051	1540.8037	1398.3142	1026.9166	696.6381	717.6856	986.5752	1054.8495	889.4822	793.4071 (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	2816.3159	2784.1785	2582.5888	2204.3257	1707.5633	1137.3499	734.0480	770.9439	1212.9220	1806.0819	2341.7002	2800.4264 (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	1451.5850	1095.9739	867.5663	477.7358	230.0814	0.0000	0.0000	0.0000	0.0000	558.9169	1045.9969	1493.2224 (98)
Space heating per m2												7220.6785 (98)
												(98) / (4) = 60.6780 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)																	93.8000 (206)
Efficiency of secondary/supplementary heating system, %																	0.0000 (208)
Space heating requirement																	7697.9515 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Space heating requirement	1451.5850	1095.9739	867.5663	477.7358	230.0814	0.0000	0.0000	0.0000	0.0000	558.9169	1045.5969	1493.2224	(98)				
Space heating efficiency (main heating system 1)	93.8000	93.8000	93.8000	93.8000	93.8000	0.0000	0.0000	0.0000	0.0000	93.8000	93.8000	93.8000	(210)				
Space heating fuel (main heating system)	1547.5320	1168.4157	924.9107	509.3133	245.2893	0.0000	0.0000	0.0000	0.0000	595.8602	1114.7088	1591.9215	(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	218.8838	192.9344	202.6459	181.6896	178.0723	159.1464	152.8738	167.7077	167.3982	188.4001	199.1750	213.6280	(64)				
Efficiency of water heater (217)m	89.2380	89.0200	88.5600	87.5767	85.7996	80.1000	80.1000	80.1000	80.1000	87.8418	88.8998	89.3069	(216)				
Fuel for water heating, kWh/month	245.2809	216.7316	228.8234	207.4634	207.5445	198.6846	190.8537	209.3729	208.9866	214.4766	224.0443	239.2067	(219)				
Water heating fuel used												2591.4693	(219)				
Annual totals kWh/year																	
Space heating fuel - main system												7697.9515	(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)												446.9894	(232)				
Total delivered energy for all uses												10811.4101	(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	7697.9515	0.2160	1662.7575 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2591.4693	0.2160	559.7574 (264)
Space and water heating			2222.5149 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	446.9894	0.5190	231.9875 (268)
Total CO2, kg/year			2493.4274 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.9500 (273)

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

DER			20.9500 ZC1
Total Floor Area	TFA	119.0000	
Assumed number of occupants	N	2.8594	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		14.1375	ZC2
CO2 emissions from cooking, equation (L16)		1.5767	ZC3
Total CO2 emissions		36.6642	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		36.6642	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.0000 (1b)	x 3.2000 (2b)	= 227.2000 (1b) - (3b)
First floor	48.0000 (1c)	x 2.6000 (2c)	= 124.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	119.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	352.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1136 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3636 (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) =		0.3364 (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	0.4289	0.4205	0.4120	0.3700	0.3616	0.3195	0.3195	0.3111	0.3364	0.3616	0.3784	0.3952 (22b)
Effective ac	0.5920	0.5884	0.5849	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5716	0.5761 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			29.7500	1.3258	39.4413		(27)
Heat Loss Floor 1			74.0000	0.1300	9.6200		(28a)
External Wall 1	164.0000	29.7500	134.2500	0.1800	24.1650		(29a)
External Wall 2	36.0000		36.0000	0.1800	6.4800		(29a)
External Roof 1 Main	71.0000		71.0000	0.1300	9.2300		(30)
Total net area of external elements Aum(A, m ²)			345.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.9363		(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)							21.7382 (36)
Total fabric heat loss						(33) + (36) =	110.6745 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	68.7623	68.3475	67.9409	66.0312	65.6738	64.0105	64.0105
Heat transfer coeff	179.4368	179.0220	178.6154	176.7056	176.3483	174.6850	174.6850
Average = Sum(39)m / 12 =							
HLP	1.5079	1.5044	1.5010	1.4849	1.4819	1.4679	1.4679
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8594 (42)
Average daily hot water use (litres/day)												102.1100 (43)
Daily hot water use	112.3210	108.2366	104.1522	100.0678	95.9834	91.8990	91.8990	95.9834	100.0678	104.1522	108.2366	112.3210 (44)
Energy conte	166.5687	145.6821	150.3308	131.0621	125.7572	108.5189	100.5587	115.3926	116.7707	136.0850	148.5475	161.3129 (45)
Energy content (annual)												Total = Sum(45)m = 1606.5872 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.9853	21.8523	22.5496	19.6593	18.8636	16.2778	15.0838	17.3089	17.5156	20.4128	22.2821	24.1969 (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)

Regs Region: England

Elmhurst Energy Systems

SAP2012 Calculator (Design

System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



**FALCON
ENERGY
LIMITED**

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.8924 (55)
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	217.4948	191.6798	201.2569	180.3454	176.6833	157.8022	151.4848	166.3187	166.0540	187.0111	197.8308	212.2390 (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	217.4948	191.6798	201.2569	180.3454	176.6833	157.8022	151.4848	166.3187	166.0540	187.0111	197.8308	212.2390 (64)
Heat gains from water heating, kWh/month	96.1250	85.2375	90.7259	83.0048	82.5551	75.5092	74.1766	79.1089	78.2529	85.9891	88.8187	94.3774 (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	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	142.9683	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3104	22.4805	18.2823	13.8409	10.3462	8.7347	9.4382	12.2681	16.4662	20.9077	24.4023	26.0138	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.9056	286.8516	279.4277	263.6229	243.6723	224.9216	212.3949	209.4488	216.8728	232.6775	252.6281	271.3789	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	37.2968	(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)	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	-114.3747	(71)
Water heating gains (Table 5)	129.2002	126.8415	121.9434	115.2844	110.9612	104.8738	99.6998	106.3292	108.6846	115.5768	123.3593	126.8513	(72)
Total internal gains	507.3067	505.0641	488.5439	461.6388	433.8702	407.4206	390.4233	396.9366	410.9141	438.0525	469.2802	493.1346	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				5.5700	10.6334	0.6300	0.7000	0.7700	18.1008 (74)			
East				9.0200	19.6403	0.6300	0.7000	0.7700	54.1409 (76)			
South				1.0200	46.7521	0.6300	0.7000	0.7700	14.5738 (78)			
West				14.1400	19.6403	0.6300	0.7000	0.7700	84.8728 (80)			
Solar gains	171.6884	330.4001	537.0304	781.9362	963.4640	990.0402	940.9138	803.6666	623.2971	389.6010	212.9384	142.0010 (83)
Total gains	678.9950	835.4642	1025.5743	1243.5750	1397.3342	1397.4608	1331.3371	1200.6032	1034.2112	827.6534	682.2186	635.1356 (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	46.0546	46.1613	46.2664	46.7664	46.8612	47.3074	47.3074	47.3909	47.1345	46.8612	46.6699	46.4715
alpha	4.0703	4.0774	4.0844	4.1178	4.1241	4.1538	4.1538	4.1594	4.1423	4.1241	4.1113	4.0981
util living area	0.9982	0.9954	0.9861	0.9521	0.8634	0.7073	0.5509	0.6208	0.8630	0.9790	0.9963	0.9986 (86)
MIT	19.2819	19.4798	19.8290	20.2903	20.6774	20.9034	20.9737	20.9576	20.7636	20.2381	19.6755	19.2524 (87)
Th 2	19.6816	19.6842	19.6868	19.6988	19.7011	19.7116	19.7116	19.7136	19.7076	19.7011	19.6965	19.6917 (88)
util rest of house	0.9975	0.9938	0.9808	0.9327	0.8087	0.5991	0.4024	0.4691	0.7846	0.9674	0.9947	0.9981 (89)
MIT 2	17.4215	17.7119	18.2206	18.8836	19.3949	19.6508	19.7030	19.6976	19.5201	18.8244	18.0067	17.3848 (90)
Living area fraction	18.5815	18.8142	19.2235	19.7607	20.1946	20.4318	20.4953	20.4832	20.2955	19.7059	19.0472	18.5493 (91)
Temperature adjustment	18.5815	18.8142	19.2235	19.7607	20.1946	20.4318	20.4953	20.4832	20.2955	19.7059	19.0472	18.5493 (92)
adjusted MIT	18.5815	18.8142	19.2235	19.7607	20.1946	20.4318	20.4953	20.4832	20.2955	19.7059	19.0472	18.5493 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	676.7519	828.9822	1003.3627	1161.3126	1162.2748	926.3440	659.3169	676.6545	852.9916	800.6807	677.7979	633.5367	(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	2562.6303	2490.9494	2272.6157	1919.1490	1498.0005	1018.7311	680.4571	712.0205	1086.2265	1605.8071	2115.5099	2551.6955	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1403.0935	1116.8419	944.3242	545.6423	249.7799	0.0000	0.0000	0.0000	0.0000	599.0141	1035.1526	1427.1102	(98)
Space heating												7320.9588	(98)
Space heating per m ²												61.5207	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7829.9024 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1403.0935	1116.8419	944.3242	545.6423	249.7799	0.0000	0.0000	0.0000	0.0000	599.0141	1035.1526	1427.1102	(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)	1500.6348	1194.4834	1009.9725	583.5746	267.1443	0.0000	0.0000	0.0000	0.0000	640.6567	1107.1151	1526.3210	(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	217.4948	191.6798	201.2569	180.3454	176.6833	157.8022	151.4848	166.3187	166.0540	187.0111	197.8308	212.2390	(64)
Efficiency of water heater (217)m	88.9002	88.7567	88.4172	87.5827	85.7372	79.8000	79.8000	79.8000	79.8000	87.7022	88.5940	88.9558	(216)
Fuel for water heating, kWh/month	244.6505	215.9610	227.6219	205.9143	206.0754	197.7471	189.8305	208.4194	208.0878	213.2343	223.3004	238.5893	(219)
Water heating fuel used												2579.4318	(219)
Annual totals kWh/year													
Space heating fuel - main system												7829.9024	(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)												446.9894	(232)
Total delivered energy for all uses												10931.3236	(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	7829.9024	0.2160	1691.2589 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2579.4318	0.2160	557.1573 (264)
Space and water heating			2248.4162 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	446.9894	0.5190	231.9875 (268)
Total CO2, kg/m2/year			2519.3287 (272)
Emissions per m2 for space and water heating			18.8943 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9495 (272b)
Emissions per m2 for pumps and fans			0.3271 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.8943 * 1.00) + 1.9495 + 0.3271, rounded to 2 d.p.			21.1700 (273)