

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	065 - PRJ013014			Issued on Date	26/03/2025
Assessment Reference	065	Prop Type Ref	1BF		
Property	Flat 3, Willoughby House,, Caveney View, Netley Abbey, SO31 5JR				
SAP Rating	82 B	DER	10.66	TER	21.41
Environmental	93 A	% DER<TER	50.22		
CO ₂ Emissions (t/year)	0.35	DFEE	49.23	TFEE	56.86
General Requirements Compliance	Pass	% DFEE<TFEE	13.41		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

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

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DWELLING AS BUILT

Top-floor flat, total floor area 53 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) 21.41 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.66 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.32 (max. 0.70)	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	OK
Openings	1.36 (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: 3.29 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

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 (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing North East: 3.36 m², No overhang
Windows facing South West: 3.03 m², No overhang
Windows facing North West: 1.45 m², No overhang
Air change rate: 5.27 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Roof U-value 0.08 W/m²K
Air permeability 3.3 m³/m²h
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 Built) (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	53.2000 (1b)	x 2.3400 (2b)	= 124.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.4880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1607 (8)
Measured/design AP50					Yes
Infiltration rate					3.2900
Number of sides sheltered					0.3252 (18)
					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3252 (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	0.4146	0.4064	0.3983	0.3577	0.3495	0.3089	0.3089	0.3008	0.3252	0.3495	0.3658	0.3821 (22b)
	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (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			1.6800	1.2000	2.0160		(26)
Windows (Uw = 1.40)			7.8400	1.3258	10.3939		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	18.2810	3.0270	15.2540	0.2100	3.2033	7.4000	112.8796 (29a)
Wl - Clad (Timber Frame)	39.0190	4.8110	34.2080	0.2100	7.1837	7.4000	253.1392 (29a)
Wl - Corridor	14.2600	1.6760	12.5840	0.3200	4.0269	13.4400	169.1290 (29a)
Rf - Ins Joist	53.1950		53.1950	0.0800	4.2556	7.4000	393.6430 (30)
Total net area of external elements Aum(A, m ²)			126.6790				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.3480		(33)
Party Floor			51.2780			20.1600	1033.7645 (32d)
Stud			102.8701			7.4000	761.2385 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2749.1113 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							51.6750 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3786 (36)
Total fabric heat loss						(33) + (36) =	43.7266 (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	24.0709	23.9338	23.7994	23.1683	23.0502	22.5005	22.5005	22.3987	22.7122	23.0502	23.2891	23.5388 (38)
Heat transfer coeff	67.7975	67.6604	67.5260	66.8948	66.7768	66.2270	66.2270	66.1252	66.4388	66.7768	67.0156	67.2654 (39)
Average = Sum(39)m / 12 =												66.8943 (39)
HLP	1.2744	1.2718	1.2693	1.2574	1.2552	1.2449	1.2449	1.2430	1.2488	1.2552	1.2597	1.2644 (40)
HLP (average)												1.2574 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7845 (42)
Average daily hot water use (litres/day)												76.5808 (43)
Daily hot water use	84.2389	81.1756	78.1124	75.0492	71.9860	68.9227	68.9227	71.9860	75.0492	78.1124	81.1756	84.2389 (44)
Energy conte	124.9238	109.2592	112.7457	98.2944	94.3158	81.3874	75.4174	86.5425	87.5761	102.0615	111.4082	120.9821 (45)
Energy content (annual)										Total = Sum(45)m =		1204.9141 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7386	16.3889	16.9119	14.7442	14.1474	12.2081	11.3126	12.9814	13.1364	15.3092	16.7112	18.1473 (46)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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)
Combi loss	1.2102	1.0200	1.0128	0.8483	0.7808	0.6451	0.5978	0.7164	0.7558	0.9168	1.0400	1.1720	(61)
Total heat required for water heating calculated for each month	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(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	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(64)
Heat gains from water heating, kWh/month	41.8397	36.5837	37.7411	32.8950	31.5552	27.2226	25.2257	28.9545	29.3080	34.1647	37.3032	40.5195	(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	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6266	12.9912	10.5652	7.9985	5.9790	5.0477	5.4542	7.0896	9.5157	12.0823	14.1018	15.0331	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.5356	157.1496	153.0825	144.4239	133.4941	123.2217	116.3590	114.7450	118.8122	127.4707	138.4005	148.6730	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	(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)	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	(71)
Water heating gains (Table 5)	56.2362	54.4400	50.7273	45.6875	42.4129	37.8091	33.9055	38.9173	40.7056	45.9203	51.8100	54.4617	(72)
Total internal gains	279.1652	277.3476	267.1418	250.8767	234.6529	218.8453	208.4856	213.5188	221.8003	238.2401	257.0792	270.9347	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast				3.3640	11.2829	0.5000	0.7200	0.7700	9.4692 (75)				
Southwest				3.0270	36.7938	0.5000	0.7200	0.7700	27.7858 (79)				
Northwest				1.4470	11.2829	0.5000	0.7200	0.7700	4.0731 (81)				
Solar gains	41.3281	74.8953	114.4231	161.8026	199.5119	206.1097	195.3656	166.0035	130.6369	85.9968	50.3208	34.8382	(83)
Total gains	320.4934	352.2430	381.5649	412.6793	434.1648	424.9550	403.8512	379.5224	352.4372	324.2369	307.4000	305.7729	(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	11.2636	11.2864	11.3089	11.4156	11.4357	11.5307	11.5307	11.5484	11.4939	11.4357	11.3950	11.3527	
alpha	1.7509	1.7524	1.7539	1.7610	1.7624	1.7687	1.7687	1.7699	1.7663	1.7624	1.7597	1.7568	
util living area	0.9188	0.9021	0.8737	0.8227	0.7450	0.6380	0.5319	0.5668	0.7188	0.8414	0.9001	0.9246	(86)
MIT	17.3148	17.6012	18.1518	18.9145	19.6779	20.3177	20.6579	20.6017	20.0857	19.1264	18.0972	17.2530	(87)
Th 2	19.8610	19.8630	19.8650	19.8743	19.8761	19.8843	19.8843	19.8858	19.8811	19.8761	19.8725	19.8688	(88)
util rest of house	0.9102	0.8916	0.8593	0.8006	0.7084	0.5756	0.4371	0.4756	0.6656	0.8171	0.8876	0.9165	(89)
MIT 2	16.5032	16.7868	17.3306	18.0825	18.8168	19.4136	19.7012	19.6622	19.2147	18.3010	17.2877	16.4474	(90)
Living area fraction	16.9014	17.1863	17.7335	18.4907	19.2393	19.8572	20.1706	20.1231	19.6420	18.7060	17.6849	16.8427	(91)
MIT	16.9014	17.1863	17.7335	18.4907	19.2393	19.8572	20.1706	20.1231	19.6420	18.7060	17.6849	16.8427	(92)
Temperature adjustment	16.7514	17.0363	17.5835	18.3407	19.0893	19.7072	20.0206	19.9731	19.4920	18.5560	17.5349	16.6927	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.8777	0.8565	0.8217	0.7630	0.6781	0.5644	0.4500	0.4836	0.6437	0.7807	0.8528	0.8852	(94)
Ext temp.	281.2869	301.6812	313.5465	314.8624	294.3867	239.8284	181.7189	183.5354	226.8644	253.1415	262.1590	270.6802	(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	844.1703	821.1493	748.4229	631.5330	493.4307	338.2323	226.5334	236.2724	358.2377	531.2742	699.3000	840.3237	(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	418.7852	349.0826	323.5480	228.0028	148.0888	0.0000	0.0000	0.0000	0.0000	206.9308	314.7415	423.8148	(98)
Space heating per m2												2412.9946	(98)
												(98) / (4) =	45.3570 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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 %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2675.1603 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	418.7852	349.0826	323.5480	228.0028	148.0888	0.0000	0.0000	0.0000	0.0000	206.9308	314.7415	423.8148 (98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000 (210)
Space heating fuel (main heating system)	464.2852	387.0095	358.7007	252.7747	164.1782	0.0000	0.0000	0.0000	0.0000	229.4133	348.9374	469.8612 (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												
Water heating requirement	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541 (64)
Efficiency of water heater (217)m	86.5205	86.3896	86.0856	85.4426	84.1539	76.2000	76.2000	76.2000	76.2000	85.0101	86.0390	76.2000 (216)
Fuel for water heating, kWh/month	145.7852	127.6533	132.1457	116.0343	113.0032	107.6542	99.7574	114.5131	115.9212	121.1366	130.6945	140.9927 (219)
Water heating fuel used												1465.2913 (219)
Annual totals kWh/year												
Space heating fuel - main system												2675.1603 (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)												258.3102 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 1.20 * 1004 * 1.00) =												-963.8364 (233)
Total delivered energy for all uses												3509.9254 (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	2675.1603	0.2160	577.8346 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1465.2913	0.2160	316.5029 (264)
Space and water heating			894.3375 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	258.3102	0.5190	134.0630 (268)
Energy saving/generation technologies			
PV Unit	-963.8364	0.5190	-500.2311 (269)
Total CO2, kg/year			567.0945 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.6600 (273)

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

DER		10.6600 ZC1
Total Floor Area	TFA	53.2000
Assumed number of occupants	N	1.7845
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.3247 ZC2
CO2 emissions from cooking, equation (L16)		3.0419 ZC3
Total CO2 emissions		31.0265 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		31.0265 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	53.2000 (1b)	x 2.3400 (2b)	= 124.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.4880 (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) = 0.1607 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4107 (18)
Number of sides sheltered					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4107 (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	0.5236	0.5133	0.5031	0.4517	0.4415	0.3901	0.3901	0.3799	0.4107	0.4415	0.4620	0.4825 (22b)
Effective ac	0.6371	0.6318	0.6265	0.6020	0.5974	0.5761	0.5761	0.5721	0.5843	0.5974	0.6067	0.6164 (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			1.6800	1.0000	1.6800		(26)
TER Opening Type (Uw = 1.40)			7.8400	1.3258	10.3939		(27)
Flr - Exposed Underside of Bay			1.9180	0.1300	0.2493		(28b)
Wl - Brick (Timber Frame)	18.2810	3.0270	15.2540	0.1800	2.7457		(29a)
Wl - Clad (Timber Frame)	39.0190	4.8110	34.2080	0.1800	6.1574		(29a)
Wl - Corridor	14.2600	1.6760	12.5840	0.1800	2.2651		(29a)
Rf - Ins Joist	53.1950		53.1950	0.1300	6.9154		(30)
Total net area of external elements Aum(A, m ²)			126.6790				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.4069		(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)							7.9657 (36)
Total fabric heat loss						(33) + (36) =	38.3726 (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	26.1716	25.9529	25.7386	24.7319	24.5436	23.6667	23.6667	23.5044	24.0045	24.5436	24.9246	25.3229 (38)
Heat transfer coeff	64.5442	64.3256	64.1112	63.1045	62.9162	62.0393	62.0393	61.8770	62.3771	62.9162	63.2972	63.6956 (39)
Average = Sum(39)m / 12 =												63.1036 (39)
HLP	1.2132	1.2091	1.2051	1.1862	1.1826	1.1662	1.1662	1.1631	1.1725	1.1826	1.1898	1.1973 (40)
HLP (average)												1.1862 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7845 (42)
Average daily hot water use (litres/day)												76.5808 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.2389	81.1756	78.1124	75.0492	71.9860	68.9227	68.9227	71.9860	75.0492	78.1124	81.1756	84.2389 (44)
Energy content (annual)	124.9238	109.2592	112.7457	98.2944	94.3158	81.3874	75.4174	86.5425	87.5761	102.0615	111.4082	120.9821 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1204.9141 (45)
Water storage loss:	18.7386	16.3889	16.9119	14.7442	14.1474	12.2081	11.3126	12.9814	13.1364	15.3092	16.7112	18.1473 (46)
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)

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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)
Combi loss	42.9272	37.3630	39.8052	37.0106	36.6833	33.9893	35.1223	36.6833	37.0106	39.8052	40.0318	42.9272 (61)
Total heat required for water heating calculated for each month	167.8510	146.6222	152.5509	135.3050	130.9991	115.3767	110.5396	123.2258	124.5867	141.8668	151.4400	163.9093 (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	167.8510	146.6222	152.5509	135.3050	130.9991	115.3767	110.5396	123.2258	124.5867	141.8668	151.4400	163.9093 (64)
Heat gains from water heating, kWh/month	52.2690	45.6694	47.4392	41.9355	40.5308	35.5586	33.8568	37.9462	38.3717	43.8868	47.0512	50.9583 (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	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.7134	13.0683	10.6279	8.0460	6.0145	5.0777	5.4866	7.1317	9.5721	12.1540	14.1855	15.1224 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.5356	157.1496	153.0825	144.4239	133.4941	123.2217	116.3590	114.7450	118.8122	127.4707	138.4005	148.6730 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223 (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)	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782 (71)
Water heating gains (Table 5)	70.2540	67.9605	63.7624	58.2438	54.4769	49.3870	45.5065	51.0030	53.2940	58.9876	65.3488	68.4924 (72)
Total internal gains	293.2699	290.9452	280.2396	263.4806	246.7524	230.4531	220.1190	225.6465	234.4452	251.3792	270.7017	285.0545 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W					
Northeast				3.3640	11.2829	0.6300	0.7000	0.7700	11.5998 (75)						
Southwest				3.0270	36.7938	0.6300	0.7000	0.7700	34.0376 (79)						
Northwest				1.4470	11.2829	0.6300	0.7000	0.7700	4.9896 (81)						
Solar gains				50.6270	91.7468	140.1683	198.2082	244.4021	252.4844	239.3229	203.3543	160.0302	105.3461	61.6429	42.6768 (83)
Total gains				343.8969	382.6920	420.4079	461.6887	491.1544	482.9375	459.4419	429.0009	394.4754	356.7253	332.3447	327.7314 (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	57.2390	57.4335	57.6255	58.5449	58.7201	59.5500	59.5500	59.7063	59.2276	58.7201	58.3666	58.0016
alpha	4.8159	4.8289	4.8417	4.9030	4.9147	4.9700	4.9700	4.9804	4.9485	4.9147	4.8911	4.8668
util living area	0.9972	0.9948	0.9881	0.9646	0.8947	0.7420	0.5752	0.6318	0.8660	0.9763	0.9947	0.9978 (86)
MIT	19.7173	19.8562	20.1013	20.4419	20.7443	20.9319	20.9846	20.9761	20.8439	20.4629	20.0373	19.6994 (87)
Th 2	19.9094	19.9127	19.9159	19.9311	19.9339	19.9472	19.9472	19.9496	19.9421	19.9339	19.9282	19.9222 (88)
util rest of house	0.9963	0.9931	0.9838	0.9507	0.8523	0.6497	0.4471	0.5029	0.7973	0.9642	0.9925	0.9971 (89)
MIT 2	18.2099	18.4145	18.7729	19.2704	19.6783	19.9008	19.9415	19.9396	19.8136	19.3086	18.6905	18.1927 (90)
Living area fraction	18.9494	19.1218	19.4246	19.8452	20.2013	20.4067	20.4532	20.4481	20.3190	19.8749	19.3513	18.9319 (92)
Temperature adjustment	18.9494	19.1218	19.4246	19.8452	20.2013	20.4067	20.4532	20.4481	20.3190	19.8749	19.3513	18.9319 (93)
adjusted MIT	18.9494	19.1218	19.4246	19.8452	20.2013	20.4067	20.4532	20.4481	20.3190	19.8749	19.3513	18.9319 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9951	0.9913	0.9812	0.9493	0.8643	0.6925	0.5104	0.5665	0.8249	0.9634	0.9909	0.9961 (94)
Ext temp.	342.2146	379.3612	412.5053	438.2742	424.4993	334.4322	234.5014	243.0378	325.3832	343.6698	329.3129	326.4536 (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	945.5369	914.8251	828.6117	690.6890	534.8686	360.2416	239.0530	250.4839	387.9256	583.5408	775.4714	938.3554 (97)
Space heating kWh	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 per m2	448.8718	359.8318	309.5831	181.7387	82.1148	0.0000	0.0000	0.0000	0.0000	178.4640	321.2341	455.2550 (98)
Space heating												2337.0932 (98)
Space heating per m2												43.9303 (99)

8c. Space cooling requirement

Not applicable

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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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2502.2411 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	448.8718	359.8318	309.5831	181.7387	82.1148	0.0000	0.0000	0.0000	0.0000	178.4640	321.2341	455.2550	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	480.5908	385.2589	331.4595	194.5810	87.9173	0.0000	0.0000	0.0000	0.0000	191.0749	343.9337	487.4250	(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	167.8510	146.6222	152.5509	135.3050	130.9991	115.3767	110.5396	123.2258	124.5867	141.8668	151.4400	163.9093	(64)
Efficiency of water heater (217)m	87.4078	87.2239	86.7963	85.7947	83.9123	80.3000	80.3000	80.3000	80.3000	85.6300	86.8982	87.4870	(216)
Fuel for water heating, kWh/month	192.0321	168.0988	175.7575	157.7079	156.1142	143.6820	137.6583	153.4568	155.1516	165.6741	174.2729	187.3528	(219)
Water heating fuel used												1966.9589	(219)
Annual totals kWh/year													
Space heating fuel - main system												2502.2411	(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)												259.8436	(232)
Total delivered energy for all uses												4804.0436	(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	2502.2411	0.2160	540.4841 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1966.9589	0.2160	424.8631 (264)
Space and water heating			965.3472 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	259.8436	0.5190	134.8588 (268)
Total CO2, kg/m2/year			1139.1310 (272)
Emissions per m2 for space and water heating			18.1456 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5349 (272b)
Emissions per m2 for pumps and fans			0.7317 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.1456 * 1.00) + 2.5349 + 0.7317, rounded to 2 d.p.			21.4100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	53.2000 (1b)	x 2.3400 (2b)	= 124.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.4880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1607 (8)
Measured/design AP50					Yes
Infiltration rate					3.2900
Number of sides sheltered					0.3252 (18)
					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3252 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.3983	0.3739	0.3658	0.3414	0.3414	0.3333	0.3333	0.3252	0.3252	0.3495	0.3495	0.3577 (22b)
	0.5793	0.5699	0.5669	0.5583	0.5583	0.5555	0.5555	0.5529	0.5529	0.5611	0.5611	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.6800	1.2000	2.0160		(26)
Windows (Uw = 1.40)			7.8400	1.3258	10.3939		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	18.2810	3.0270	15.2540	0.2100	3.2033	7.4000	112.8796 (29a)
Wl - Clad (Timber Frame)	39.0190	4.8110	34.2080	0.2100	7.1837	7.4000	253.1392 (29a)
Wl - Corridor	14.2600	1.6760	12.5840	0.3200	4.0269	13.4400	169.1290 (29a)
Rf - Ins Joist	53.1950		53.1950	0.0800	4.2556	7.4000	393.6430 (30)
Total net area of external elements Aum(A, m ²)			126.6790				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3480		(33)
Party Floor			51.2780			20.1600	1033.7645 (32d)
Stud			102.8701			7.4000	761.2385 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 2749.1113 (34)
51.6750 (35)
12.3786 (36)
(33) + (36) = 43.7266 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.7994	23.4126	23.2891	22.9348	22.9348	22.8222	22.8222	22.7122	22.7122	23.0502	23.0502	23.1683 (38)
Heat transfer coeff	67.5260	67.1392	67.0156	66.6614	66.6614	66.5487	66.5487	66.4388	66.4388	66.7768	66.7768	66.8948 (39)
Average = Sum(39)m / 12 =												66.7856 (39)
HLP	1.2693	1.2620	1.2597	1.2530	1.2530	1.2509	1.2509	1.2488	1.2488	1.2552	1.2552	1.2574 (40)
HLP (average)												1.2554 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7845 (42)
Average daily hot water use (litres/day)												76.5808 (43)
Daily hot water use	84.2389	81.1756	78.1124	75.0492	71.9860	68.9227	68.9227	71.9860	75.0492	78.1124	81.1756	84.2389 (44)
Energy conte	124.9238	109.2592	112.7457	98.2944	94.3158	81.3874	75.4174	86.5425	87.5761	102.0615	111.4082	120.9821 (45)
Energy content (annual)												Total = Sum(45)m = 1204.9141 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7386	16.3889	16.9119	14.7442	14.1474	12.2081	11.3126	12.9814	13.1364	15.3092	16.7112	18.1473 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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)
Combi loss	1.2102	1.0200	1.0128	0.8483	0.7808	0.6451	0.5978	0.7164	0.7558	0.9168	1.0400	1.1720	(61)
Total heat required for water heating calculated for each month	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(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	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(64)
RHI water heating demand													
Heat gains from water heating, kWh/month	41.8397	36.5837	37.7411	32.8950	31.5552	27.2226	25.2257	28.9545	29.3080	34.1647	37.3032	40.5195	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.5665	32.4780	26.4129	19.9963	14.9474	12.6193	13.6356	17.7240	23.7891	30.2058	35.2546	37.5828	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.1427	234.5517	228.4813	215.5581	199.2450	183.9129	173.6702	171.2613	177.3317	190.2548	206.5679	221.9000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	(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)	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	(71)
Water heating gains (Table 5)	56.2362	54.4400	50.7273	45.6875	42.4129	37.8091	33.9055	38.9173	40.7056	45.9203	51.8100	54.4617	(72)
Total internal gains	411.1257	407.6499	391.8018	367.4221	342.7856	320.5216	307.3916	314.0829	328.0067	352.5611	379.8128	400.1248	(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	
													3.3640	14.6130	0.5000	0.7200	0.7700	12.2640 (75)	
Northeast													3.3640	14.6130	0.5000	0.7200	0.7700	12.2640 (75)	
Southwest													3.0270	45.0642	0.5000	0.7200	0.7700	34.0314 (79)	
Northwest													1.4470	14.6130	0.5000	0.7200	0.7700	5.2753 (81)	
Solar gains	51.5707	79.9250	125.1857	179.7613	209.7608	239.4544	219.3109	193.6624	151.1183	100.5466	62.6694	42.6827 (83)							
Total gains	462.6963	487.5749	516.9875	547.1835	552.5465	559.9760	526.7025	507.7453	479.1250	453.1077	442.4822	442.8075 (84)							

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	11.3089	11.3740	11.3950	11.4555	11.4555	11.4749	11.4749	11.4939	11.4939	11.4357	11.4357	11.4156		
alpha	1.7539	1.7583	1.7597	1.7637	1.7637	1.7650	1.7650	1.7663	1.7663	1.7624	1.7624	1.7610		
util living area	0.8485	0.8320	0.7929	0.7244	0.6227	0.4745	0.3600	0.3612	0.5500	0.7141	0.8088	0.8548	(86)	
MIT	18.1746	18.3669	18.8660	19.5310	20.1881	20.6718	20.8663	20.8699	20.5457	19.8563	18.9703	18.1672	(87)	
Th 2	19.8650	19.8707	19.8725	19.8778	19.8778	19.8795	19.8795	19.8811	19.8811	19.8761	19.8761	19.8743	(88)	
util rest of house	0.8329	0.8149	0.7707	0.6925	0.5727	0.3969	0.2543	0.2518	0.4753	0.6726	0.7857	0.8397	(89)	
MIT 2	17.3460	17.5364	18.0228	18.6640	19.2756	19.6898	19.8300	19.8348	19.5988	18.9824	18.1345	17.3461	(90)	
Living area fraction	17.7525	17.9438	18.4365	19.0894	19.7233	20.1716	20.3384	20.3426	20.0634	19.4111	18.5445	17.7489	(92)	
MIT	17.7525	17.9438	18.4365	19.0894	19.7233	20.1716	20.3384	20.3426	20.0634	19.4111	18.5445	17.7489	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	17.6025	17.7938	18.2865	18.9394	19.5733	20.0216	20.1884	20.1926	19.9134	19.2611	18.3945	17.5989	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	367.3133	378.2264	379.0168	361.9921	308.0611	228.1714	150.2458	144.3325	228.8862	292.7630	331.1355	354.7031	(94)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000	(96)
Heat loss rate W	803.7306	785.1137	709.4596	589.2444	431.5168	274.2840	165.6030	158.9619	293.2183	464.8417	640.6916	789.2878	(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	324.6945	273.4282	245.8495	163.6216	91.8510	0.0000	0.0000	0.0000	0.0000	128.0266	222.8804	323.3310	(98)
Space heating												1773.6828	(98)
RHI space heating demand												1774	(98)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.2000 (1b)	x 2.3400 (2b)	= 124.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.4880 (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) = 0.1607 (8)
Measured/design AP50					Yes 3.2900
Infiltration rate					0.3252 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3252 (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	0.4146	0.4064	0.3983	0.3577	0.3495	0.3089	0.3089	0.3008	0.3252	0.3495	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (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			1.6800	1.2000	2.0160		(26)
Windows (Uw = 1.40)			7.8400	1.3258	10.3939		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	18.2810	3.0270	15.2540	0.2100	3.2033	7.4000	112.8796 (29a)
Wl - Clad (Timber Frame)	39.0190	4.8110	34.2080	0.2100	7.1837	7.4000	253.1392 (29a)
Wl - Corridor	14.2600	1.6760	12.5840	0.3200	4.0269	13.4400	169.1290 (29a)
Rf - Ins Joist	53.1950		53.1950	0.0800	4.2556	7.4000	393.6430 (30)
Total net area of external elements Aum(A, m ²)			126.6790				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3480		(33)
Party Floor			51.2780			20.1600	1033.7645 (32d)
Stud			102.8701			7.4000	761.2385 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2749.1113 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							51.6750 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3786 (36)
Total fabric heat loss						(33) + (36) =	43.7266 (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	24.0709	23.9338	23.7994	23.1683	23.0502	22.5005	22.5005	22.3987	22.7122	23.0502	23.2891	23.5388 (38)
Heat transfer coeff	67.7975	67.6604	67.5260	66.8948	66.7768	66.2270	66.2270	66.1252	66.4388	66.7768	67.0156	67.2654 (39)
Average = Sum(39)m / 12 =												66.8943 (39)
HLP	1.2744	1.2718	1.2693	1.2574	1.2552	1.2449	1.2449	1.2430	1.2488	1.2552	1.2597	1.2644 (40)
HLP (average)												1.2574 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7845 (42)
Average daily hot water use (litres/day)												76.5808 (43)
Daily hot water use	84.2389	81.1756	78.1124	75.0492	71.9860	68.9227	68.9227	71.9860	75.0492	78.1124	81.1756	84.2389 (44)
Energy conte	124.9238	109.2592	112.7457	98.2944	94.3158	81.3874	75.4174	86.5425	87.5761	102.0615	111.4082	120.9821 (45)
Energy content (annual)										Total = Sum(45)m =		1204.9141 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7386	16.3889	16.9119	14.7442	14.1474	12.2081	11.3126	12.9814	13.1364	15.3092	16.7112	18.1473 (46)

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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	(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	(57)
Combi loss	1.2102	1.0200	1.0128	0.8483	0.7808	0.6451	0.5978	0.7164	0.7558	0.9168	1.0400	(61)
Total heat required for water heating calculated for each month	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	(64)
Heat gains from water heating, kWh/month	41.8397	36.5837	37.7411	32.8950	31.5552	27.2226	25.2257	28.9545	29.3080	34.1647	37.3032	(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	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.5665	32.4780	26.4129	19.9963	14.9474	12.6193	13.6356	17.7240	23.7891	30.2058	35.2546	37.5828	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.1427	234.5517	228.4813	215.5581	199.2450	183.9129	173.6702	171.2613	177.3317	190.2548	206.5679	221.9000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	(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)	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	(71)
Water heating gains (Table 5)	56.2362	54.4400	50.7273	45.6875	42.4129	37.8091	33.9055	38.9173	40.7056	45.9203	51.8100	54.4617	(72)
Total internal gains	411.1257	407.6499	391.8018	367.4221	342.7856	320.5216	307.3916	314.0829	328.0067	352.5611	379.8128	400.1248	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				3.3640	11.2829	0.5000	0.7200	0.7700	9.4692 (75)			
Southwest				3.0270	36.7938	0.5000	0.7200	0.7700	27.7858 (79)			
Northwest				1.4470	11.2829	0.5000	0.7200	0.7700	4.0731 (81)			
Solar gains	41.3281	74.8953	114.4231	161.8026	199.5119	206.1097	195.3656	166.0035	130.6369	85.9968	50.3208	34.8382 (83)
Total gains	452.4538	482.5453	506.2249	529.2247	542.2975	526.6313	502.7572	480.0864	458.6436	438.5579	430.1336	434.9630 (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	11.2636	11.2864	11.3089	11.4156	11.4357	11.5307	11.5307	11.5484	11.4939	11.4357	11.3950	11.3527		
alpha	1.7509	1.7524	1.7539	1.7610	1.7624	1.7687	1.7687	1.7699	1.7663	1.7624	1.7597	1.7568		
util living area	0.8690	0.8504	0.8187	0.7628	0.6804	0.5680	0.4604	0.4893	0.6384	0.7721	0.8432	0.8762	(86)	
MIT	17.7490	18.0091	18.5093	19.1994	19.8801	20.4429	20.7323	20.6903	20.2615	19.4187	18.4785	17.6881	(87)	
Th 2	19.8610	19.8630	19.8650	19.8743	19.8761	19.8843	19.8843	19.8858	19.8811	19.8761	19.8725	19.8688	(88)	
util rest of house	0.8563	0.8358	0.8000	0.7363	0.6401	0.5048	0.3708	0.4017	0.5809	0.7415	0.8257	0.8641	(89)	
MIT 2	16.9243	17.1800	17.6707	18.3457	18.9927	19.5085	19.7454	19.7175	19.3565	18.5688	17.6526	16.8702	(90)	
Living area fraction									fLA = Living area / (4) =			0.4906	(91)	
MIT	17.3289	17.5868	18.0821	18.7645	19.4280	19.9669	20.2296	20.1947	19.8005	18.9858	18.0578	17.2715	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	17.1789	17.4368	17.9321	18.6145	19.2780	19.8169	20.0796	20.0447	19.6505	18.8358	17.9078	17.1215	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	369.9866	384.3408	385.2388	371.0959	333.9134	263.6315	194.9384	199.3954	260.2501	310.3266	338.5668	359.3562	(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	873.1578	848.2420	771.9653	649.8507	506.0358	345.5013	230.4410	241.0095	368.7679	549.9586	724.2907	869.1679	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	374.3594	311.7416	287.7245	200.7035	128.0591	0.0000	0.0000	0.0000	0.0000	178.2862	277.7212	379.2998	(98)	
Space heating												2137.8954	(98)	
Space heating per m2												40.1860	(99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2370.1723 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	374.3594	311.7416	287.7245	200.7035	128.0591	0.0000	0.0000	0.0000	0.0000	178.2862	277.7212	379.2998	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	415.0326	345.6116	318.9850	222.5094	141.9724	0.0000	0.0000	0.0000	0.0000	197.6566	307.8949	420.5098	(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													
Water heating requirement	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(64)
Efficiency of water heater	86.2083	86.0679	85.7367	85.0343	83.6506	76.2000	76.2000	76.2000	76.2000	84.5149	85.6640	76.2000	(216)
(217)m												86.3360	(217)
Fuel for water heating, kWh/month	146.3131	128.1304	132.6835	116.5915	113.6831	107.6542	99.7574	114.5131	115.9212	121.8464	131.2665	141.4869	(219)
Water heating fuel used												1469.8473	(219)
Annual totals kWh/year													
Space heating fuel - main system												2370.1723	(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)												258.3102	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1004 * 1.00) =												-963.8364	(233)
Total delivered energy for all uses												3209.4934	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2370.1723	3.4800	82.4820 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1469.8473	3.4800	51.1507 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	258.3102	13.1900	34.0711 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (252)
Total energy cost			297.5963 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2728 (257)
SAP value	82.2442	
SAP rating (Section 12)	82	(258)
SAP band	B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2370.1723	0.2160	511.9572 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1469.8473	0.2160	317.4870 (264)
Space and water heating			829.4442 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	258.3102	0.5190	134.0630 (268)
Energy saving/generation technologies			
PV Unit	-963.8364	0.5190	-500.2311 (269)
Total kg/year			502.2011 (272)
CO2 emissions per m2			9.4400 (273)
EI value			93.1472
EI rating			93
EI band			A

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4

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Water heating energy efficiency
Water heating environmental impact

$3.48 / 0.8233 = 4.227$, stars = 4
 $0.216 / 0.8233 = 0.2623$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	53.2000 (1b)	x 2.3400 (2b)	= 124.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.4880 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1607 (8)
Measured/design AP50					Yes
Infiltration rate					3.2900
Number of sides sheltered					0.3252 (18)
					0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3252 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.3983	0.3739	0.3658	0.3414	0.3414	0.3333	0.3333	0.3252	0.3252	0.3495	0.3495	0.3577 (22b)
	0.5793	0.5699	0.5669	0.5583	0.5583	0.5555	0.5555	0.5529	0.5529	0.5611	0.5611	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.6800	1.2000	2.0160		(26)
Windows (Uw = 1.40)			7.8400	1.3258	10.3939		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	18.2810	3.0270	15.2540	0.2100	3.2033	7.4000	112.8796 (29a)
Wl - Clad (Timber Frame)	39.0190	4.8110	34.2080	0.2100	7.1837	7.4000	253.1392 (29a)
Wl - Corridor	14.2600	1.6760	12.5840	0.3200	4.0269	13.4400	169.1290 (29a)
Rf - Ins Joist	53.1950		53.1950	0.0800	4.2556	7.4000	393.6430 (30)
Total net area of external elements Aum(A, m ²)			126.6790				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.3480		(33)
Party Floor			51.2780			20.1600	1033.7645 (32d)
Stud			102.8701			7.4000	761.2385 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2749.1113 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							51.6750 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.3786 (36)
Total fabric heat loss						(33) + (36) =	43.7266 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.7994	23.4126	23.2891	22.9348	22.9348	22.8222	22.8222	22.7122	22.7122	23.0502	23.0502	23.1683 (38)
Heat transfer coeff	67.5260	67.1392	67.0156	66.6614	66.6614	66.5487	66.5487	66.4388	66.4388	66.7768	66.7768	66.8948 (39)
Average = Sum(39)m / 12 =												66.7856 (39)
HLP	1.2693	1.2620	1.2597	1.2530	1.2530	1.2509	1.2509	1.2488	1.2488	1.2552	1.2552	1.2574 (40)
HLP (average)												1.2554 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7845 (42)
Average daily hot water use (litres/day)												76.5808 (43)
Daily hot water use	84.2389	81.1756	78.1124	75.0492	71.9860	68.9227	68.9227	71.9860	75.0492	78.1124	81.1756	84.2389 (44)
Energy conte	124.9238	109.2592	112.7457	98.2944	94.3158	81.3874	75.4174	86.5425	87.5761	102.0615	111.4082	120.9821 (45)
Energy content (annual)										Total = Sum(45)m =		1204.9141 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7386	16.3889	16.9119	14.7442	14.1474	12.2081	11.3126	12.9814	13.1364	15.3092	16.7112	18.1473 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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)
Combi loss	1.2102	1.0200	1.0128	0.8483	0.7808	0.6451	0.5978	0.7164	0.7558	0.9168	1.0400	1.1720	(61)
Total heat required for water heating calculated for each month	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(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	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(64)
Heat gains from water heating, kWh/month	41.8397	36.5837	37.7411	32.8950	31.5552	27.2226	25.2257	28.9545	29.3080	34.1647	37.3032	40.5195	(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	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	107.0673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.5665	32.4780	26.4129	19.9963	14.9474	12.6193	13.6356	17.7240	23.7891	30.2058	35.2546	37.5828	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.1427	234.5517	228.4813	215.5581	199.2450	183.9129	173.6702	171.2613	177.3317	190.2548	206.5679	221.9000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	47.4912	(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)	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	(71)
Water heating gains (Table 5)	56.2362	54.4400	50.7273	45.6875	42.4129	37.8091	33.9055	38.9173	40.7056	45.9203	51.8100	54.4617	(72)
Total internal gains	411.1257	407.6499	391.8018	367.4221	342.7856	320.5216	307.3916	314.0829	328.0067	352.5611	379.8128	400.1248	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W				

Northeast					3.3640	14.6130		0.5000	0.7200	0.7700		12.2640 (75)				
Southwest					3.0270	45.0642		0.5000	0.7200	0.7700		34.0314 (79)				
Northwest					1.4470	14.6130		0.5000	0.7200	0.7700		5.2753 (81)				

Solar gains					51.5707	79.9250	125.1857	179.7613	209.7608	239.4544	219.3109	193.6624	151.1183	100.5466	62.6694	42.6827 (83)
Total gains					462.6963	487.5749	516.9875	547.1835	552.5465	559.9760	526.7025	507.7453	479.1250	453.1077	442.4822	442.8075 (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	11.3089	11.3740	11.3950	11.4555	11.4555	11.4749	11.4749	11.4939	11.4939	11.4357	11.4357	11.4156		
alpha	1.7539	1.7583	1.7597	1.7637	1.7637	1.7650	1.7650	1.7663	1.7663	1.7624	1.7624	1.7610		
util living area	0.8485	0.8320	0.7929	0.7244	0.6227	0.4745	0.3600	0.3612	0.5500	0.7141	0.8088	0.8548	(86)	
MIT	18.1746	18.3669	18.8660	19.5310	20.1881	20.6718	20.8663	20.8699	20.5457	19.8563	18.9703	18.1672	(87)	
Th 2	19.8650	19.8707	19.8725	19.8778	19.8778	19.8795	19.8795	19.8811	19.8811	19.8761	19.8761	19.8743	(88)	
util rest of house	0.8329	0.8149	0.7707	0.6925	0.5727	0.3969	0.2543	0.2518	0.4753	0.6726	0.7857	0.8397	(89)	
MIT 2	17.3460	17.5364	18.0228	18.6640	19.2756	19.6898	19.8300	19.8348	19.5988	18.9824	18.1345	17.3461	(90)	
Living area fraction	17.7525	17.9438	18.4365	19.0894	19.7233	20.1716	20.3384	20.3426	20.0634	19.4111	18.5445	17.7489	(91)	
MIT	17.7525	17.9438	18.4365	19.0894	19.7233	20.1716	20.3384	20.3426	20.0634	19.4111	18.5445	17.7489	(92)	
Temperature adjustment	17.6025	17.7938	18.2865	18.9394	19.5733	20.0216	20.1884	20.1926	19.9134	19.2611	18.3945	17.5989	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	367.3133	378.2264	379.0168	361.9921	308.0611	228.1714	150.2458	144.3325	228.8862	292.7630	331.1355	354.7031	(94)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000	(96)
Heat loss rate W	803.7306	785.1137	709.4596	589.2444	431.5168	274.2840	165.6030	158.9619	293.2183	464.8417	640.6916	789.2878	(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	324.6945	273.4282	245.8495	163.6216	91.8510	0.0000	0.0000	0.0000	0.0000	128.0266	222.8804	323.3310	(98)
Space heating												1773.6828	(98)
Space heating per m2												33.3399	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1966.3889 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	324.6945	273.4282	245.8495	163.6216	91.8510	0.0000	0.0000	0.0000	0.0000	128.0266	222.8804	323.3310	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	359.9717	303.1355	272.5604	181.3987	101.8304	0.0000	0.0000	0.0000	0.0000	141.9363	247.0958	358.4601	(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													
Water heating requirement	126.1340	110.2791	113.7585	99.1428	95.0966	82.0325	76.0151	87.2590	88.3320	102.9784	112.4482	122.1541	(64)
Efficiency of water heater (217)m	85.7901	85.6760	85.2455	84.3526	82.4906	76.2000	76.2000	76.2000	76.2000	83.3716	84.9652	76.2000	(216)
Fuel for water heating, kWh/month	147.0263	128.7165	133.4480	117.5338	115.2818	107.6542	99.7574	114.5131	115.9212	123.5173	132.3461	142.2484	(219)
Water heating fuel used												1477.9641	(219)
Annual totals kWh/year													
Space heating fuel - main system												1966.3889	(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)												258.3102	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.20 * 1130 * 1.00) =												-1084.4081	(233)
Total delivered energy for all uses												2693.2551	(238)

10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1966.3889	5.7300	112.6741 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1477.9641	5.7300	84.6873 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	258.3102	24.1800	62.4594 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (252)
Total energy cost			391.9558 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1966.3889	0.2160	424.7400 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1477.9641	0.2160	319.2403 (264)
Space and water heating			743.9803 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	258.3102	0.5190	134.0630 (268)
Energy saving/generation technologies			
PV Unit	-1084.4081	0.5190	-562.8078 (269)
Total kg/year			354.1604 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1966.3889	1.2200	2398.9944 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1477.9641	1.2200	1803.1163 (264)
Space and water heating			4202.1107 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	258.3102	3.0700	793.0123 (268)
Energy saving/generation technologies			
PV Unit	-1084.4081	3.0700	-3329.1328 (269)
Primary energy kWh/year			1896.2402 (272)
Primary energy kWh/m2/year			35.6436 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 82
Current environmental impact rating: A 93

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

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

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

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 567 TEST (07 Mar 2025)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£81	£81	£0
Mains gas	£311	£311	£0
Space heating	£245	£245	£0
Water heating	£85	£85	£0
Lighting	£62	£62	£0
Total cost of fuels	£392	£392	£0
Total cost of uses	£392	£392	£0
Delivered energy	51 kWh/m²	51 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	36 kWh/m²	36 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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 Built)

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

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

No improvements selected / applicable

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	065 - PRJ013014	Issued on Date	26/03/2025
Assessment Reference	065	Prop Type Ref	1BF
Property	Flat 3, Willoughby House,, Caveney View, Netley Abbey, SO31 5JR		
SAP Rating	82 B	DER	10.66
Environmental	93 A	TER	21.41
CO ₂ Emissions (t/year)	0.35	% DER<TER	50.22
General Requirements Compliance	Pass	DFEE	49.23
		TFEE	56.86
		% DFEE<TFEE	13.41
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk		Assessor ID
			U903-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	21.41	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.66	kgCO ₂ /m ²	Pass
	-10.75 (-50.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.86	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	49.23	kWh/m ² /yr	
	-7.7 (-13.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.32 (max. 0.70)	Pass
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	Pass
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.29 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB) Combi boiler Efficiency: 89.3% SEDBUK2009 Minimum: 88.0%	Pass
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BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

3.36 m², No overhang

Windows facing South West

3.03 m², No overhang

Windows facing North West

1.45 m², No overhang

Air change rate

5.27 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.29 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Roof U-value

0.08

W/m²K

Air permeability

3.3

m³/m²h

Photovoltaic array

1.20

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.