

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	066 - PRJ013014			Issued on Date	26/03/2025
Assessment Reference	066	Prop Type Ref	1BF		
Property	Flat 4, Willoughby House, Caveney View, Netley Abbey, SO31 5JR				
SAP Rating	83 B	DER	10.12	TER	20.61
Environmental	94 A	% DER<TER	50.90		
CO ₂ Emissions (t/year)	0.33	DFEE	45.99	TFEE	51.73
General Requirements Compliance	Pass	% DFEE<TFEE	11.09		
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) 20.61 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.12 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.32 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	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: 3.31 (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 East: 2.72 m², No overhang
Air change rate: 5.22 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K
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	53.3700 (1b)	x 2.3400 (2b)	= 124.8858 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.8858 (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) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					3.3100
Infiltration rate					0.3256 (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) = 0.3012 (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	0.3841	0.3765	0.3690	0.3313	0.3238	0.2862	0.2862	0.2786	0.3012	0.3238	0.3389	0.3539 (22b)
	0.5738	0.5709	0.5681	0.5549	0.5524	0.5409	0.5409	0.5388	0.5454	0.5524	0.5574	0.5626 (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)			6.0900	1.3258	8.0606		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	3.6260		3.6260	0.2100	0.7615	7.4000	26.8324 (29a)
Wl - Clad (Timber Frame)	39.0640	6.0880	32.9760	0.2100	6.9250	7.4000	244.0224 (29a)
Wl - Corridor	15.3120	1.6760	13.6360	0.3200	4.3635	13.4400	183.2678 (29a)
Rf - Ins Joist	53.3680		53.3680	0.0800	4.2694	7.4000	394.9232 (30)
Total net area of external elements Aum(A, m ²)			113.2840				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6645		(33)
Party Wall			14.2600	0.0000	0.0000	7.4000	105.5240 (32)
Party Floor			51.4510			20.1600	1037.2522 (32d)
Stud			103.4777			7.4000	765.7349 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 2782.8745 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							52.1430 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.1476 (36)
Total fabric heat loss							(33) + (36) = 39.8121 (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	23.6456	23.5276	23.4119	22.8685	22.7668	22.2936	22.2936	22.2059	22.4759	22.7668	22.9725	23.1875 (38)
Heat transfer coeff	63.4577	63.3397	63.2240	62.6806	62.5789	62.1057	62.1057	62.0180	62.2880	62.5789	62.7846	62.9996 (39)
Average = Sum(39)m / 12 =												62.6801 (39)
HLP	1.1890	1.1868	1.1846	1.1745	1.1725	1.1637	1.1637	1.1620	1.1671	1.1725	1.1764	1.1804 (40)
HLP (average)												1.1744 (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												1.7895 (42)
Average daily hot water use (litres/day)												76.6997 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.3697	81.3017	78.2337	75.1657	72.0977	69.0298	69.0298	72.0977	75.1657	78.2337	81.3017	84.3697 (44)
Energy conte	125.1178	109.4289	112.9208	98.4471	94.4623	81.5138	75.5345	86.6770	87.7122	102.2201	111.5812	121.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1206.7854 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	18.7677	16.4143	16.9381	14.7671	14.1693	12.2271	11.3302	13.0015	13.1568	15.3330	16.7372	18.1755 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.2140	1.0231	1.0159	0.8510	0.7832	0.6471	0.5996	0.7187	0.7582	0.9197	1.0433	1.1757 (61)
Total heat required for water heating calculated for each month	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (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	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (64)
Heat gains from water heating, kWh/month	41.9052	36.6409	37.8001	32.9464	31.6045	27.2651	25.2651	28.9998	29.3538	34.2181	37.3616	40.5829 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.5114	13.7771	11.2043	8.4823	6.3407	5.3530	5.7842	7.5185	10.0913	12.8132	14.9549	15.9425 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.9756	157.5942	153.5155	144.8325	133.8718	123.5703	116.6882	115.0697	119.1483	127.8313	138.7921	149.0936 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473 (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)	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785 (71)
Water heating gains (Table 5)	56.3242	54.5251	50.8066	45.7589	42.4792	37.8682	33.9585	38.9782	40.7692	45.9920	51.8911	54.5469 (72)
Total internal gains	280.6531	278.7383	268.3684	251.9157	235.5336	219.6334	209.2728	214.4082	222.8508	239.4785	258.4799	272.4249 (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)
Southeast				2.7240	36.7938	0.5000		0.7200		0.7700		25.0045 (77)
Solar gains	34.4737	61.8667	93.0032	129.2389	157.5399	162.0229	153.8676	131.8943	105.4163	70.6285	41.8643	29.1317 (83)
Total gains	315.1268	340.6051	361.3716	381.1546	393.0735	381.6563	363.1404	346.3025	328.2670	310.1070	300.3442	301.5566 (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	12.1817	12.2044	12.2267	12.3327	12.3527	12.4469	12.4469	12.4645	12.4104	12.3527	12.3123	12.2702
alpha	1.8121	1.8136	1.8151	1.8222	1.8235	1.8298	1.8298	1.8310	1.8274	1.8235	1.8208	1.8180
util living area	0.9193	0.9045	0.8794	0.8342	0.7631	0.6597	0.5523	0.5828	0.7293	0.8455	0.9011	0.9249 (86)
MIT	17.4803	17.7432	18.2560	18.9712	19.6996	20.3250	20.6631	20.6130	20.1196	19.2081	18.2297	17.4209 (87)
Th 2	19.9288	19.9306	19.9323	19.9405	19.9420	19.9492	19.9492	19.9505	19.9464	19.9420	19.9389	19.9357 (88)
util rest of house	0.9110	0.8946	0.8661	0.8139	0.7294	0.6010	0.4615	0.4960	0.6793	0.8226	0.8892	0.9172 (89)
MIT 2	16.7079	16.9683	17.4755	18.1819	18.8858	19.4728	19.7620	19.7259	19.2937	18.4227	17.4587	16.6538 (90)
Living area fraction									fLA = Living area / (4) =			0.4971 (91)
MIT	17.0919	17.3535	17.8635	18.5743	19.2903	19.8964	20.2099	20.1669	19.7042	18.8132	17.8420	17.0352 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.9419	17.2035	17.7135	18.4243	19.1403	19.7464	20.0599	20.0169	19.5542	18.6632	17.6920	16.8852 (93)

8. Space heating requirement

Utilisation	0.8796	0.8610	0.8303	0.7777	0.6990	0.5881	0.4721	0.5021	0.6574	0.7876	0.8557	0.8869 (94)
Useful gains	277.1953	293.2565	300.0300	296.4361	274.7650	224.4696	171.4562	173.8862	215.7875	244.2548	257.0038	267.4442 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	802.2231	779.3018	708.9620	596.9861	465.6086	319.6234	214.8822	224.3111	339.7328	504.5835	665.0124	799.1597 (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	390.6207	326.6224	304.2454	216.3960	141.9876	0.0000	0.0000	0.0000	0.0000	193.6846	293.7662	395.5964 (98)
Space heating												2262.9192 (98)
Space heating per m2										(98) / (4) =		42.4006 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2508.7797 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	390.6207	326.6224	304.2454	216.3960	141.9876	0.0000	0.0000	0.0000	0.0000	193.6846	293.7662	395.5964	(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)	433.0606	362.1091	337.3009	239.9069	157.4142	0.0000	0.0000	0.0000	0.0000	214.7279	325.6831	438.5769	(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	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456	(64)
Efficiency of water heater (217)m	86.3241	86.1979	85.9000	85.2722	84.0036	76.2000	76.2000	76.2000	76.2000	84.7871	85.8298	76.2000	(216)
Fuel for water heating, kWh/month	146.3458	128.1377	132.6387	116.4484	113.3827	107.8227	99.9136	114.6924	116.1028	121.6455	131.2183	141.5247	(219)
Water heating fuel used												1469.8732	(219)
Annual totals kWh/year													
Space heating fuel - main system												2508.7797	(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)												273.9358	(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												3363.7523	(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	2508.7797	0.2160	541.8964 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1469.8732	0.2160	317.4926 (264)
Space and water heating			859.3890 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	273.9358	0.5190	142.1727 (268)
Energy saving/generation technologies			
PV Unit	-963.8364	0.5190	-500.2311 (269)
Total CO2, kg/year			540.2556 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.1200 (273)

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

DER			10.1200 ZC1
Total Floor Area		TFA	53.3700
Assumed number of occupants		N	1.7895
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.3183 ZC2
CO2 emissions from cooking, equation (L16)			3.0344 ZC3
Total CO2 emissions			30.4727 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			30.4727 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3700 (1b)	x 2.3400 (2b)	= 124.8858 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.8858 (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) = 0.1601 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4101 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3794 (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	0.4837	0.4742	0.4647	0.4173	0.4078	0.3604	0.3604	0.3509	0.3794	0.4078	0.4268	0.4458 (22b)
	0.6170	0.6124	0.6080	0.5871	0.5832	0.5649	0.5649	0.5616	0.5720	0.5832	0.5911	0.5994 (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)			6.0900	1.3258	8.0606		(27)
Flr - Exposed Underside of Bay			1.9180	0.1300	0.2493		(28b)
Wl - Brick (Timber Frame)	3.6260		3.6260	0.1800	0.6527		(29a)
Wl - Clad (Timber Frame)	39.0640	6.0880	32.9760	0.1800	5.9357		(29a)
Wl - Corridor	15.3120	1.6760	13.6360	0.1800	2.4545		(29a)
Rf - Ins Joist	53.3680		53.3680	0.1300	6.9378		(30)
Total net area of external elements Aum(A, m ²)			113.2840				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.9706	(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)							7.9679 (36)
Total fabric heat loss						(33) + (36) =	33.9385 (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	25.4276	25.2404	25.0569	24.1949	24.0336	23.2829	23.2829	23.1439	23.5721	24.0336	24.3599	24.7010 (38)
Heat transfer coeff	59.3661	59.1789	58.9954	58.1334	57.9722	57.2214	57.2214	57.0824	57.5106	57.9722	58.2984	58.6395 (39)
Average = Sum(39)m / 12 =												58.1327 (39)
HLP	1.1124	1.1088	1.1054	1.0893	1.0862	1.0722	1.0722	1.0696	1.0776	1.0862	1.0923	1.0987 (40)
HLP (average)												1.0892 (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												1.7895 (42)
Average daily hot water use (litres/day)												76.6997 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.3697	81.3017	78.2337	75.1657	72.0977	69.0298	69.0298	72.0977	75.1657	78.2337	81.3017	84.3697 (44)
Energy content (annual)	125.1178	109.4289	112.9208	98.4471	94.4623	81.5138	75.5345	86.6770	87.7122	102.2201	111.5812	121.1699 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1206.7854 (45)
Water storage loss:	18.7677	16.4143	16.9381	14.7671	14.1693	12.2271	11.3302	13.0015	13.1568	15.3330	16.7372	18.1755 (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	42.9939	37.4211	39.8670	37.0680	36.7402	34.0421	35.1768	36.7402	37.0680	39.8670	40.0940	42.9939	(61)
Total heat required for water heating calculated for each month	168.1117	146.8499	152.7878	135.5151	131.2025	115.5559	110.7113	123.4172	124.7802	142.0871	151.6752	164.1638	(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	168.1117	146.8499	152.7878	135.5151	131.2025	115.5559	110.7113	123.4172	124.7802	142.0871	151.6752	164.1638	(64)
Heat gains from water heating, kWh/month	52.3501	45.7404	47.5129	42.0007	40.5938	35.6139	33.9094	38.0051	38.4313	43.9549	47.1242	51.0375	(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	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	89.4731	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.6079	13.8628	11.2740	8.5351	6.3801	5.3864	5.8201	7.5652	10.1541	12.8929	15.0479	16.0417	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.9756	157.5942	153.5155	144.8325	133.8718	123.5703	116.6882	115.0697	119.1483	127.8313	138.7921	149.0936	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	31.9473	(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)	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	(71)
Water heating gains (Table 5)	70.3631	68.0660	63.8615	58.3342	54.5615	49.4637	45.5772	51.0822	53.3768	59.0792	65.4503	68.5988	(72)
Total internal gains	294.7886	292.3649	281.4929	264.5438	247.6554	231.2622	220.9275	226.5590	235.5211	252.6454	272.1323	286.5760	(73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
Northeast												3.3640	11.2829	0.6300	0.7000	0.7700	11.5998
Southeast												2.7240	36.7938	0.6300	0.7000	0.7700	30.6305 (77)
Solar gains	42.2303	75.7868	113.9290	158.3176	192.9864	198.4780	188.4879	161.5705	129.1349	86.5199	51.2838	35.6863 (83)					
Total gains	337.0189	368.1517	395.4219	422.8615	440.6418	429.7403	409.4153	388.1295	364.6561	339.1653	323.4161	322.2622 (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	62.4304	62.6279	62.8227	63.7542	63.9315	64.7703	64.7703	64.9281	64.4446	63.9315	63.5738	63.2040		
alpha	5.1620	5.1752	5.1882	5.2503	5.2621	5.3180	5.3180	5.3285	5.2963	5.2621	5.2383	5.2136		
util living area	0.9975	0.9955	0.9901	0.9712	0.9119	0.7676	0.5963	0.6467	0.8745	0.9782	0.9951	0.9980	(86)	
MIT	19.8390	19.9605	20.1769	20.4791	20.7555	20.9351	20.9863	20.9794	20.8610	20.5173	20.1312	19.8214	(87)	
Th 2	19.9908	19.9936	19.9964	20.0096	20.0121	20.0236	20.0236	20.0258	20.0192	20.0121	20.0071	20.0019	(88)	
util rest of house	0.9966	0.9940	0.9865	0.9598	0.8754	0.6814	0.4735	0.5243	0.8109	0.9673	0.9931	0.9973	(89)	
MIT 2	18.4450	18.6243	18.9411	19.3842	19.7614	19.9778	20.0183	20.0167	19.9024	19.4448	18.8838	18.4273	(90)	
Living area fraction									fLA = Living area / (4) =			0.4971	(91)	
MIT	19.1380	19.2886	19.5554	19.9285	20.2556	20.4537	20.4995	20.4953	20.3789	19.9779	19.5039	19.1203	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.1380	19.2886	19.5554	19.9285	20.2556	20.4537	20.4995	20.4953	20.3789	19.9779	19.5039	19.1203	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	335.5550	365.4103	389.2689	405.3728	390.2291	310.1927	219.0207	227.2661	305.2285	327.9266	320.7575	321.1450	(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	880.8732	851.4991	770.2093	641.1232	495.9849	334.9568	223.1345	233.7667	361.1041	543.6582	723.1257	874.9194	(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	405.7167	326.6517	283.4196	169.7403	78.6824	0.0000	0.0000	0.0000	0.0000	160.5043	289.7051	412.0081	(98)
Space heating												2126.4282	(98)
Space heating per m2												39.8431	(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												2276.6897 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	405.7167	326.6517	283.4196	169.7403	78.6824	0.0000	0.0000	0.0000	0.0000	160.5043	289.7051	412.0081 (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)	434.3862	349.7341	303.4471	181.7348	84.2424	0.0000	0.0000	0.0000	0.0000	171.8462	310.1768	441.1222 (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	168.1117	146.8499	152.7878	135.5151	131.2025	115.5559	110.7113	123.4172	124.7802	142.0871	151.6752	164.1638 (64)
Efficiency of water heater (217)m	87.1873	87.0060	86.5854	85.6192	83.8103	80.3000	80.3000	80.3000	80.3000	85.3586	86.6546	80.3000 (216)
Fuel for water heating, kWh/month	192.8168	168.7813	176.4591	158.2766	156.5470	143.9052	137.8721	153.6951	155.3925	166.4590	175.0342	188.1050 (219)
Water heating fuel used												1973.3439 (219)
Annual totals kWh/year												
Space heating fuel - main system												2276.6897 (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)												275.6402 (232)
Total delivered energy for all uses												4600.6739 (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	2276.6897	0.2160	491.7650 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1973.3439	0.2160	426.2423 (264)
Space and water heating			918.0073 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	275.6402	0.5190	143.0573 (268)
Total CO2, kg/m2/year			1099.9895 (272)
Emissions per m2 for space and water heating			17.2008 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6805 (272b)
Emissions per m2 for pumps and fans			0.7293 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.2008 * 1.00) + 2.6805 + 0.7293, rounded to 2 d.p.			20.6100 (273)

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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	53.3700 (1b)	x 2.3400 (2b)	= 124.8858 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.8858 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					3.3100
Infiltration rate					0.3256 (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) =	0.3012 (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												
	0.3690	0.3464	0.3389	0.3163	0.3163	0.3088	0.3088	0.3012	0.3012	0.3238	0.3238	0.3313 (22b)
Effective ac	0.5681	0.5600	0.5574	0.5500	0.5500	0.5477	0.5477	0.5454	0.5454	0.5524	0.5524	0.5549 (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)			6.0900	1.3258	8.0606		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	3.6260		3.6260	0.2100	0.7615	7.4000	26.8324 (29a)
Wl - Clad (Timber Frame)	39.0640	6.0880	32.9760	0.2100	6.9250	7.4000	244.0224 (29a)
Wl - Corridor	15.3120	1.6760	13.6360	0.3200	4.3635	13.4400	183.2678 (29a)
Rf - Ins Joist	53.3680		53.3680	0.0800	4.2694	7.4000	394.9232 (30)
Total net area of external elements Aum(A, m ²)			113.2840				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6645		(33)
Party Wall			14.2600	0.0000	0.0000	7.4000	105.5240 (32)
Party Floor			51.4510			20.1600	1037.2522 (32d)
Stud			103.4777			7.4000	765.7349 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 2782.8745 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							52.1430 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.1476 (36)
Total fabric heat loss							(33) + (36) = 39.8121 (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	23.4119	23.0788	22.9725	22.6675	22.6675	22.5705	22.5705	22.4759	22.4759	22.7668	22.7668	22.8685 (38)
Heat transfer coeff	63.2240	62.8909	62.7846	62.4796	62.4796	62.3826	62.3826	62.2880	62.2880	62.5789	62.5789	62.6806 (39)
Average = Sum(39)m / 12 =												62.5865 (39)
HLP	1.1846	1.1784	1.1764	1.1707	1.1707	1.1689	1.1689	1.1671	1.1671	1.1725	1.1725	1.1745 (40)
HLP (average)												1.1727 (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												1.7895 (42)
Average daily hot water use (litres/day)												76.6997 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	84.3697	81.3017	78.2337	75.1657	72.0977	69.0298	69.0298	72.0977	75.1657	78.2337	81.3017	84.3697 (44)
Energy conte	125.1178	109.4289	112.9208	98.4471	94.4623	81.5138	75.5345	86.6770	87.7122	102.2201	111.5812	121.1699 (45)
Energy content (annual)										Total = Sum(45)m =		1206.7854 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	18.7677	16.4143	16.9381	14.7671	14.1693	12.2271	11.3302	13.0015	13.1568	15.3330	16.7372	18.1755 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.2140	1.0231	1.0159	0.8510	0.7832	0.6471	0.5996	0.7187	0.7582	0.9197	1.0433	1.1757 (61)
Total heat required for water heating calculated for each month	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (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	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	41.9052	36.6409	37.8001	32.9464	31.6045	27.2651	25.2651	28.9998	29.3538	34.2181	37.3616	40.5829 (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	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.7784	34.4427	28.0107	21.2059	15.8516	13.3826	14.4604	18.7962	25.2282	32.0330	37.3872	39.8562 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.7995	235.2152	229.1276	216.1679	199.8086	184.4332	174.1615	171.7458	177.8333	190.7930	207.1523	222.5277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262 (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)	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785 (71)
Water heating gains (Table 5)	56.3242	54.5251	50.8066	45.7589	42.4792	37.8682	33.9585	38.9782	40.7692	45.9920	51.8911	54.5469 (72)
Total internal gains	414.2176	410.4985	394.2604	369.4482	344.4550	321.9995	308.8959	315.8356	330.1462	355.1335	382.7461	403.2464 (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)			
Southeast				2.7240	45.0642	0.5000	0.7200	0.7700	30.6249 (77)			
Solar gains	42.8889	65.7835	101.3439	143.0704	165.1712	187.7910	172.2863	153.3681	121.4641	82.2615	51.9718	35.5917 (83)
Total gains	457.1064	476.2819	495.6043	512.5186	509.6261	509.7905	481.1822	469.2037	451.6103	437.3950	434.7178	438.8381 (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	12.2267	12.2914	12.3123	12.3724	12.3724	12.3916	12.3916	12.4104	12.4104	12.3527	12.3527	12.3327
alpha	1.8151	1.8194	1.8208	1.8248	1.8248	1.8261	1.8261	1.8274	1.8274	1.8235	1.8235	1.8222
util living area	0.8461	0.8314	0.7959	0.7332	0.6356	0.4894	0.3707	0.3687	0.5547	0.7139	0.8063	0.8521 (86)
MIT	18.3401	18.5130	18.9728	19.5911	20.2170	20.6827	20.8730	20.8783	20.5742	19.9295	19.0960	18.3339 (87)
Th 2	19.9323	19.9373	19.9389	19.9435	19.9435	19.9450	19.9450	19.9464	19.9464	19.9420	19.9420	19.9405 (88)
util rest of house	0.8310	0.8150	0.7749	0.7031	0.5882	0.4148	0.2687	0.2638	0.4837	0.6743	0.7840	0.8374 (89)
MIT 2	17.5501	17.7215	18.1703	18.7682	19.3536	19.7561	19.8953	19.9005	19.6758	19.0968	18.2986	17.5506 (90)
Living area fraction									fLA = Living area / (4) =			0.4971 (91)
MIT	17.9428	18.1149	18.5692	19.1773	19.7828	20.2167	20.3813	20.3866	20.1224	19.5108	18.6950	17.9400 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.7928	17.9649	18.4192	19.0273	19.6328	20.0667	20.2313	20.2366	19.9724	19.3608	18.5450	17.7900 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7933	0.7774	0.7388	0.6730	0.5727	0.4240	0.2981	0.2944	0.4856	0.6491	0.7483	0.8001 (94)
Useful gains	362.6447	370.2734	366.1614	344.9145	291.8410	216.1735	143.4211	138.1544	219.3100	283.9142	325.3088	351.1118 (95)
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	764.5573	746.1970	673.0038	557.7735	408.1662	259.9304	157.9110	151.7680	278.5782	441.8544	609.8322	751.5382 (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	299.0230	252.6206	228.2907	153.2585	86.5459	0.0000	0.0000	0.0000	0.0000	117.5075	204.8568	297.9172 (98)
Space heating												1640.0203 (98)
RHI space heating demand												1640 (98)

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Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.3700 (1b)	x 2.3400 (2b)	= 124.8858 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.8858 (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) = 0.1601 (8)
Measured/design AP50					Yes
Infiltration rate					3.3100
Number of sides sheltered					0.3256 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3012 (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	0.3841	0.3765	0.3690	0.3313	0.3238	0.2862	0.2862	0.2786	0.3012	0.3238	0.3389	0.3539 (22b)
	0.5738	0.5709	0.5681	0.5549	0.5524	0.5409	0.5409	0.5388	0.5454	0.5524	0.5574	0.5626 (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)			6.0900	1.3258	8.0606		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	3.6260		3.6260	0.2100	0.7615	7.4000	26.8324 (29a)
Wl - Clad (Timber Frame)	39.0640	6.0880	32.9760	0.2100	6.9250	7.4000	244.0224 (29a)
Wl - Corridor	15.3120	1.6760	13.6360	0.3200	4.3635	13.4400	183.2678 (29a)
Rf - Ins Joist	53.3680		53.3680	0.0800	4.2694	7.4000	394.9232 (30)
Total net area of external elements Aum(A, m ²)			113.2840				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6645		(33)
Party Wall			14.2600	0.0000	0.0000	7.4000	105.5240 (32)
Party Floor			51.4510			20.1600	1037.2522 (32d)
Stud			103.4777			7.4000	765.7349 (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

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	23.6456	23.5276	23.4119	22.8685	22.7668	22.2936	22.2936	22.2059	22.4759	22.7668	22.9725	23.1875 (38)
Average = Sum(39)m / 12 =	63.4577	63.3397	63.2240	62.6806	62.5789	62.1057	62.1057	62.0180	62.2880	62.5789	62.7846	62.9996 (39)
												62.6801 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1890	1.1868	1.1846	1.1745	1.1725	1.1637	1.1637	1.1620	1.1671	1.1725	1.1764	1.1804 (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												1.7895 (42)
Average daily hot water use (litres/day)												76.6997 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.3697	81.3017	78.2337	75.1657	72.0977	69.0298	69.0298	72.0977	75.1657	78.2337	81.3017	84.3697 (44)
Energy content (annual)	125.1178	109.4289	112.9208	98.4471	94.4623	81.5138	75.5345	86.6770	87.7122	102.2201	111.5812	121.1699 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1206.7854 (45)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

	18.7677	16.4143	16.9381	14.7671	14.1693	12.2271	11.3302	13.0015	13.1568	15.3330	16.7372	18.1755 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.2140	1.0231	1.0159	0.8510	0.7832	0.6471	0.5996	0.7187	0.7582	0.9197	1.0433	1.1757 (61)
Total heat required for water heating calculated for each month	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (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	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (64)
Heat gains from water heating, kWh/month	41.9052	36.6409	37.8001	32.9464	31.6045	27.2651	25.2651	28.9998	29.3538	34.2181	37.3616	40.5829 (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	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.7784	34.4427	28.0107	21.2059	15.8516	13.3826	14.4604	18.7962	25.2282	32.0330	37.3872	39.8562 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.7995	235.2152	229.1276	216.1679	199.8086	184.4332	174.1615	171.7458	177.8333	190.7930	207.1523	222.5277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262 (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)	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785 (71)
Water heating gains (Table 5)	56.3242	54.5251	50.8066	45.7589	42.4792	37.8682	33.9585	38.9782	40.7692	45.9920	51.8911	54.5469 (72)
Total internal gains	414.2176	410.4985	394.2604	369.4482	344.4550	321.9995	308.8959	315.8356	330.1462	355.1335	382.7461	403.2464 (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)		
Southeast					2.7240	36.7938	0.5000	0.7200	0.7700	25.0045 (77)		
Solar gains	34.4737	61.8667	93.0032	129.2389	157.5399	162.0229	153.8676	131.8943	105.4163	70.6285	41.8643	29.1317 (83)
Total gains	448.6913	472.3652	487.2637	498.6871	501.9949	484.0224	462.7635	447.7298	435.5625	425.7620	424.6104	432.3780 (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	12.1817	12.2044	12.2267	12.3327	12.3527	12.4469	12.4469	12.4645	12.4104	12.3527	12.3123	12.2702
alpha	1.8121	1.8136	1.8151	1.8222	1.8235	1.8298	1.8298	1.8310	1.8274	1.8235	1.8208	1.8180
util living area	0.8666	0.8498	0.8210	0.7700	0.6925	0.5816	0.4715	0.4967	0.6420	0.7716	0.8408	0.8737 (86)
MIT	17.9335	18.1704	18.6329	19.2754	19.9194	20.4627	20.7448	20.7083	20.3057	19.5139	18.6272	17.8749 (87)
Th 2	19.9288	19.9306	19.9323	19.9405	19.9420	19.9492	19.9492	19.9505	19.9464	19.9420	19.9389	19.9357 (88)
util rest of house	0.8542	0.8358	0.8033	0.7451	0.6545	0.5214	0.3855	0.4131	0.5873	0.7423	0.8238	0.8619 (89)
MIT 2	17.1476	17.3807	17.8350	18.4645	19.0789	19.5792	19.8121	19.7871	19.4454	18.7038	17.8394	17.0951 (90)
Living area fraction									fLA = Living area / (4) =			0.4971 (91)
MIT	17.5383	17.7733	18.2316	18.8676	19.4967	20.0184	20.2758	20.2450	19.8730	19.1065	18.2310	17.4827 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3883	17.6233	18.0816	18.7176	19.3467	19.8684	20.1258	20.0950	19.7230	18.9565	18.0810	17.3327 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	366.5624	376.9428	373.1870	354.6416	316.3930	249.8851	185.6196	190.5409	250.1328	302.2654	334.0589	356.7964 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	830.5516	805.8870	732.2356	615.3719	478.5217	327.1975	218.9692	229.1578	350.2471	522.9396	689.4400	827.3566 (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	345.2080	288.2505	267.1322	187.7258	120.6237	0.0000	0.0000	0.0000	0.0000	164.1816	255.8744	350.0967 (98)
Space heating												1979.0930 (98)
Space heating per m2										(98) / (4) =		37.0825 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 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													2194.1164 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.2080	288.2505	267.1322	187.7258	120.6237	0.0000	0.0000	0.0000	0.0000	164.1816	255.8744	350.0967	(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)	382.7140	319.5682	296.1554	208.1217	133.7292	0.0000	0.0000	0.0000	0.0000	182.0195	283.6745	388.1339	(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	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456	(64)
Efficiency of water heater (217)m	85.9684	85.8314	85.5031	84.8094	83.4363	76.2000	76.2000	76.2000	76.2000	84.2293	85.4043	76.2000	(216)
Fuel for water heating, kWh/month	146.9515	128.6848	133.2545	117.0838	114.1535	107.8227	99.9136	114.6924	116.1028	122.4512	131.8720	142.0916	(219)
Water heating fuel used												1475.0745	(219)
Annual totals kWh/year													
Space heating fuel - main system												2194.1164	(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)												273.9358	(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												3054.2903	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2194.1164	3.4800	76.3553 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1475.0745	3.4800	51.3326 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	273.9358	13.1900	36.1321 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (252)
Total energy cost			293.7125 (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] =	1.2540 (257)
SAP value		82.5062
SAP rating (Section 12)		83 (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	2194.1164	0.2160	473.9291 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1475.0745	0.2160	318.6161 (264)
Space and water heating			792.5452 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	273.9358	0.5190	142.1727 (268)
Energy saving/generation technologies			
PV Unit	-963.8364	0.5190	-500.2311 (269)
Total kg/year			473.4118 (272)
CO2 emissions per m2			8.8700 (273)
EI value			93.5512
EI rating			94 (274)
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

$3.48 / 0.8217 = 4.235$, stars = 4
 $0.216 / 0.8217 = 0.2629$, 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	53.3700 (1b)	x 2.3400 (2b)	= 124.8858 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.8858 (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) = 0.1601 (8)
Pressure test					Yes
Measured/design AP50					3.3100
Infiltration rate					0.3256 (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) =				0.3012 (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	0.3690	0.3464	0.3389	0.3163	0.3163	0.3088	0.3088	0.3012	0.3012	0.3238	0.3238	0.3313 (22b)
	0.5681	0.5600	0.5574	0.5500	0.5500	0.5477	0.5477	0.5454	0.5454	0.5524	0.5524	0.5549 (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)			6.0900	1.3258	8.0606		(27)
Flr - Exposed Underside of Bay			1.9180	0.1400	0.2685	13.2000	25.3176 (28b)
Wl - Brick (Timber Frame)	3.6260		3.6260	0.2100	0.7615	7.4000	26.8324 (29a)
Wl - Clad (Timber Frame)	39.0640	6.0880	32.9760	0.2100	6.9250	7.4000	244.0224 (29a)
Wl - Corridor	15.3120	1.6760	13.6360	0.3200	4.3635	13.4400	183.2678 (29a)
Rf - Ins Joist	53.3680		53.3680	0.0800	4.2694	7.4000	394.9232 (30)
Total net area of external elements Aum(A, m ²)			113.2840				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6645		(33)
Party Wall			14.2600	0.0000	0.0000	7.4000	105.5240 (32)
Party Floor			51.4510			20.1600	1037.2522 (32d)
Stud			103.4777			7.4000	765.7349 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 2782.8745 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							52.1430 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.1476 (36)
Total fabric heat loss							(33) + (36) = 39.8121 (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	23.4119	23.0788	22.9725	22.6675	22.6675	22.5705	22.5705	22.4759	22.4759	22.7668	22.7668	22.8685 (38)
Heat transfer coeff	63.2240	62.8909	62.7846	62.4796	62.4796	62.3826	62.3826	62.2880	62.2880	62.5789	62.5789	62.6806 (39)
Average = Sum(39)m / 12 =												62.5865 (39)
HLP	1.1846	1.1784	1.1764	1.1707	1.1707	1.1689	1.1689	1.1671	1.1671	1.1725	1.1725	1.1745 (40)
HLP (average)												1.1727 (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												1.7895 (42)
Average daily hot water use (litres/day)												76.6997 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.3697	81.3017	78.2337	75.1657	72.0977	69.0298	69.0298	72.0977	75.1657	78.2337	81.3017	84.3697 (44)
Energy conte	125.1178	109.4289	112.9208	98.4471	94.4623	81.5138	75.5345	86.6770	87.7122	102.2201	111.5812	121.1699 (45)
Energy content (annual)												Total = Sum(45)m = 1206.7854 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

	18.7677	16.4143	16.9381	14.7671	14.1693	12.2271	11.3302	13.0015	13.1568	15.3330	16.7372	18.1755 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.2140	1.0231	1.0159	0.8510	0.7832	0.6471	0.5996	0.7187	0.7582	0.9197	1.0433	1.1757 (61)
Total heat required for water heating calculated for each month	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (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	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456 (64)
Heat gains from water heating, kWh/month	41.9052	36.6409	37.8001	32.9464	31.6045	27.2651	25.2651	28.9998	29.3538	34.2181	37.3616	40.5829 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677	107.3677 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.7784	34.4427	28.0107	21.2059	15.8516	13.3826	14.4604	18.7962	25.2282	32.0330	37.3872	39.8562 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.7995	235.2152	229.1276	216.1679	199.8086	184.4332	174.1615	171.7458	177.8333	190.7930	207.1523	222.5277 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262	47.5262 (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)	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785	-71.5785 (71)
Water heating gains (Table 5)	56.3242	54.5251	50.8066	45.7589	42.4792	37.8682	33.9585	38.9782	40.7692	45.9920	51.8911	54.5469 (72)
Total internal gains	414.2176	410.4985	394.2604	369.4482	344.4550	321.9995	308.8959	315.8356	330.1462	355.1335	382.7461	403.2464 (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)		
Southeast				2.7240	45.0642	0.5000	0.7200	0.7700		30.6249 (77)		

Solar gains	42.8889	65.7835	101.3439	143.0704	165.1712	187.7910	172.2863	153.3681	121.4641	82.2615	51.9718	35.5917 (83)
Total gains	457.1064	476.2819	495.6043	512.5186	509.6261	509.7905	481.1822	469.2037	451.6103	437.3950	434.7178	438.8381 (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	12.2267	12.2914	12.3123	12.3724	12.3724	12.3916	12.3916	12.4104	12.4104	12.3527	12.3527	12.3327
alpha	1.8151	1.8194	1.8208	1.8248	1.8248	1.8261	1.8261	1.8274	1.8274	1.8235	1.8235	1.8222
util living area	0.8461	0.8314	0.7959	0.7332	0.6356	0.4894	0.3707	0.3687	0.5547	0.7139	0.8063	0.8521 (86)
MIT	18.3401	18.5130	18.9728	19.5911	20.2170	20.6827	20.8730	20.8783	20.5742	19.9295	19.0960	18.3339 (87)
Th 2	19.9323	19.9373	19.9389	19.9435	19.9435	19.9450	19.9450	19.9464	19.9464	19.9420	19.9420	19.9405 (88)
util rest of house	0.8310	0.8150	0.7749	0.7031	0.5882	0.4148	0.2687	0.2638	0.4837	0.6743	0.7840	0.8374 (89)
MIT 2	17.5501	17.7215	18.1703	18.7682	19.3536	19.7561	19.8953	19.9005	19.6758	19.0968	18.2986	17.5506 (90)
Living area fraction									fLA = Living area / (4) =			0.4971 (91)
MIT	17.9428	18.1149	18.5692	19.1773	19.7828	20.2167	20.3813	20.3866	20.1224	19.5108	18.6950	17.9400 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.7928	17.9649	18.4192	19.0273	19.6328	20.0667	20.2313	20.2366	19.9724	19.3608	18.5450	17.7900 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	362.6447	370.2734	366.1614	344.9145	291.8410	216.1735	143.4211	138.1544	219.3100	283.9142	325.3088	351.1118 (95)
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	764.5573	746.1970	673.0038	557.7735	408.1662	259.9304	157.9110	151.7680	278.5782	441.8544	609.8322	751.5382 (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	299.0230	252.6206	228.2907	153.2585	86.5459	0.0000	0.0000	0.0000	0.0000	117.5075	204.8568	297.9172 (98)
Space heating												1640.0203 (98)
Space heating per m2										(98) / (4) =		30.7293 (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													1818.2044 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	299.0230	252.6206	228.2907	153.2585	86.5459	0.0000	0.0000	0.0000	0.0000	117.5075	204.8568	297.9172	(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)	331.5111	280.0672	253.0939	169.9097	95.9489	0.0000	0.0000	0.0000	0.0000	130.2744	227.1140	330.2852	(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	126.3318	110.4520	113.9367	99.2981	95.2455	82.1609	76.1341	87.3956	88.4703	103.1397	112.6244	122.3456	(64)
Efficiency of water heater (217)m	85.5327	85.4254	85.0007	84.1233	82.2798	76.2000	76.2000	76.2000	76.2000	83.0661	84.6808	76.2000	(216)
Fuel for water heating, kWh/month	147.7000	129.2965	134.0421	118.0388	115.7581	107.8227	99.9136	114.6924	116.1028	124.1658	132.9987	142.8929	(219)
Water heating fuel used												1483.4243	(219)
Annual totals kWh/year													
Space heating fuel - main system												1818.2044	(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)												273.9358	(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												2566.1563	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1818.2044	5.7300	104.1831 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1483.4243	5.7300	85.0002 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	273.9358	24.1800	66.2377 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (252)
Total energy cost			387.5560 (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	1818.2044	0.2160	392.7321 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1483.4243	0.2160	320.4196 (264)
Space and water heating			713.1518 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	273.9358	0.5190	142.1727 (268)
Energy saving/generation technologies			
PV Unit	-1084.4081	0.5190	-562.8078 (269)
Total kg/year			331.4417 (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	1818.2044	1.2200	2218.2093 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1483.4243	1.2200	1809.7776 (264)
Space and water heating			4027.9869 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	273.9358	3.0700	840.9829 (268)
Energy saving/generation technologies			
PV Unit	-1084.4081	3.0700	-3329.1328 (269)
Primary energy kWh/year			1770.0870 (272)
Primary energy kWh/m2/year			33.1663 (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 83
Current environmental impact rating: A 94

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

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

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 94

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	£84	£84	£0
Mains gas	£303	£303	£0
Space heating	£236	£236	£0
Water heating	£85	£85	£0
Lighting	£66	£66	£0
Total cost of fuels	£387	£387	£0
Total cost of uses	£387	£387	£0
Delivered energy	48 kWh/m²	48 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	33 kWh/m²	33 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	066 - PRJ013014	Issued on Date	26/03/2025
Assessment Reference	066	Prop Type Ref	1BF
Property	Flat 4, Willoughby House, Caveney View, Netley Abbey, SO31 5JR		
SAP Rating	83 B	DER	10.12
Environmental	94 A	TER	20.61
CO ₂ Emissions (t/year)	0.33	% DER<TER	50.90
General Requirements Compliance	Pass	DfEE	45.99
		TfEE	51.73
		% DfEE<TfEE	11.09
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)	20.61	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.12	kgCO ₂ /m ²	Pass
	-10.49 (-50.9%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	51.73	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	45.99	kWh/m ² /yr	
	-5.7 (-11.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.32 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	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	3.31 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

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

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 East

2.72 m², No overhang

Air change rate

5.22 ach

Blinds/curtains

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

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.31 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

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.