

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	063 - PRJ013014			Issued on Date	26/03/2025
Assessment Reference	063	Prop Type Ref	1BF		
Property	Flat 1, Willoughby House, Caveney View, Netley Abbey, SO31 5JR				
SAP Rating	82 B	DER	5.77	TER	21.97
Environmental	97 A	% DER<TER	73.74		
CO ₂ Emissions (t/year)	0.00	DFEE	56.59	TFEE	58.44
General Requirements Compliance	Pass	% DFEE<TFEE	3.18		
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

Ground-floor flat, total floor area 51 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) 21.97 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 5.77 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)58.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)56.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.32 (max. 0.70)	OK
Floor	0.20 (max. 0.25)	0.20 (max. 0.70)	OK
Roof (no roof)			
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:	3.53 (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
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Hot water controls: No cylinder

Boiler interlock

Boiler interlock	Yes	OK
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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):	Not significant	OK
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Based on:

Overshading:	Average
Windows facing North East:	3.64 m ² , No overhang
Windows facing South West:	3.16 m ² , No overhang
Air change rate:	5.28 ach
Blinds/curtains:	Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Air permeability	3.5 m ³ /m ² h
Photovoltaic array	2.00 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	51.2800 (1b)	x 2.3900 (2b)	= 122.5592 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.5592 (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) = 0.1632 (8)
Pressure test					Yes
Measured/design AP50					3.5300
Infiltration rate					0.3397 (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) =				0.3397 (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	0.4331	0.4246	0.4161	0.3737	0.3652	0.3227	0.3227	0.3142	0.3397	0.3652	0.3821	0.3991 (22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5797 (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)			6.8000	1.3258	9.0152		(27)
F1r - Ground			51.2800	0.2000	10.2560	75.6000	3876.7680 (28a)
W1 - Brick (Timber Frame)	51.3130	6.7980	44.5150	0.2100	9.3482	7.4000	329.4110 (29a)
W1 - Clad (Timber Frame)	3.5300		3.5300	0.2100	0.7413	7.4000	26.1220 (29a)
W1 - Corridor	14.6080	1.6760	12.9320	0.3200	4.1382	13.4400	173.8061 (29a)
Total net area of external elements Aum(A, m ²)			120.7370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5148		(33)
Party Ceiling			51.2780			7.4000	379.4572 (32b)
Stud			105.3791			7.4000	779.8053 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5565.3696 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							108.5290 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8111 (36)
Total fabric heat loss						(33) + (36) =	46.3259 (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	24.0155	23.8682	23.7238	23.0457	22.9188	22.3281	22.3281	22.2188	22.5557	22.9188	23.1755	23.4438 (38)
Heat transfer coeff	70.3414	70.1941	70.0497	69.3716	69.2447	68.6541	68.6541	68.5447	68.8816	69.2447	69.5014	69.7697 (39)
Average = Sum(39)m / 12 =												69.3710 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3717	1.3688	1.3660	1.3528	1.3503	1.3388	1.3388	1.3367	1.3432	1.3503	1.3553	1.3606 (40)
HLP (average)												1.3528 (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												1.7278 (42)
Average daily hot water use (litres/day)												75.2360 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.7595	79.7501	76.7407	73.7312	70.7218	67.7124	67.7124	70.7218	73.7312	76.7407	79.7501	82.7595 (44)
Energy conte	122.7300	107.3405	110.7657	96.5683	92.6595	79.9581	74.0930	85.0228	86.0382	100.2692	109.4517	118.8575 (45)
Energy content (annual)											Total = Sum(45)m =	1183.7545 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.4095	16.1011	16.6149	14.4852	13.8989	11.9937	11.1139	12.7534	12.9057	15.0404	16.4178	17.8286 (46)
Water storage loss:												

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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	1.1681	0.9844	0.9775	0.8188	0.7536	0.6226	0.5770	0.6915	0.7295	0.8849	1.0038	1.1312 (61)
Total heat required for water heating calculated for each month	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (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	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (64)
Heat gains from water heating, kWh/month	41.0997	35.9368	37.0740	32.3136	30.9977	26.7417	24.7802	28.4429	28.7901	33.5607	36.6436	39.8029 (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	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4830	12.8636	10.4614	7.9200	5.9203	4.9981	5.4007	7.0200	9.4222	11.9637	13.9634	14.8855	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.5577	152.1200	148.1830	139.8016	129.2216	119.2779	112.6349	111.0726	115.0096	123.3910	133.9710	143.9147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	(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)	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	(71)
Water heating gains (Table 5)	55.2416	53.4774	49.8306	44.8801	41.6636	37.1413	33.3067	38.2298	39.9862	45.1085	50.8940	53.4985	(72)
Total internal gains	272.1997	270.3785	260.3925	244.5191	228.7229	213.3348	203.2597	208.2398	216.3355	232.3806	250.7457	264.2161	(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				3.6350	11.2829	0.5000	0.7200		0.7700		10.2320 (75)	
Southwest				3.1630	36.7938	0.5000	0.7200		0.7700		29.0342 (79)	
Solar gains	39.2663	70.2836	105.1926	145.4702	176.7500	181.5470	172.5024	148.2375	118.9945	80.1124	47.6508	33.2032 (83)
Total gains	311.4659	340.6621	365.5851	389.9893	405.4729	394.8818	375.7621	356.4773	335.3300	312.4930	298.3966	297.4194 (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	21.9776	22.0237	22.0691	22.2849	22.3257	22.5178	22.5178	22.5537	22.4434	22.3257	22.2432	22.1577	
alpha	2.4652	2.4682	2.4713	2.4857	2.4884	2.5012	2.5012	2.5036	2.4962	2.4884	2.4829	2.4772	
util living area	0.9719	0.9632	0.9473	0.9144	0.8537	0.7514	0.6330	0.6695	0.8250	0.9250	0.9620	0.9748	(86)
MIT	18.3070	18.5210	18.9290	19.5004	20.0742	20.5549	20.7996	20.7608	20.3812	19.6599	18.8924	18.2662	(87)
Th 2	19.7851	19.7873	19.7895	19.7997	19.8016	19.8106	19.8106	19.8122	19.8071	19.8016	19.7977	19.7937	(88)
util rest of house	0.9670	0.9567	0.9373	0.8963	0.8177	0.6783	0.5111	0.5543	0.7682	0.9056	0.9541	0.9704	(89)
MIT 2	17.3513	17.5646	17.9695	18.5367	19.0883	19.5301	19.7220	19.6989	19.3849	18.7006	17.9422	17.3166	(90)
Living area fraction									fLA = Living area / (4) =			0.4715	(91)
MIT	17.8020	18.0156	18.4220	18.9911	19.5532	20.0134	20.2301	20.1996	19.8547	19.1529	18.3903	17.7644	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6520	17.8656	18.2720	18.8411	19.4032	19.8634	20.0801	20.0496	19.7047	19.0029	18.2403	17.6144	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9550	0.9428	0.9207	0.8779	0.8032	0.6820	0.5420	0.5805	0.7623	0.8887	0.9402	0.9594	(94)
Ext temp.	297.4591	321.1668	336.6015	342.3763	325.6576	269.3236	203.6676	206.9173	255.6244	277.7159	280.5638	285.3378	(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	939.1958	910.1097	824.6237	689.6301	533.4053	361.3508	238.9258	250.1607	386.0599	581.8594	774.2639	935.9163	(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	477.4522	395.7696	363.0885	250.0227	154.5642	0.0000	0.0000	0.0000	0.0000	226.2828	355.4641	484.0304	(98)
Space heating per m2												2706.6744	(98)
										(98) / (4) =		52.7823	(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													3000.7477 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	477.4522	395.7696	363.0885	250.0227	154.5642	0.0000	0.0000	0.0000	0.0000	226.2828	355.4641	484.0304	(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)	529.3261	438.7690	402.5371	277.1871	171.3572	0.0000	0.0000	0.0000	0.0000	250.8678	394.0843	536.6191	(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	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887	(64)
Efficiency of water heater (217)m	86.9101	86.7741	86.4617	85.7820	84.3613	76.2000	76.2000	76.2000	76.2000	85.3554	86.4352	76.2000	(216)
Fuel for water heating, kWh/month	142.5589	124.8356	129.2402	113.5286	110.7298	105.7490	97.9920	112.4859	113.8684	118.5094	127.7900	137.8802	(219)
Water heating fuel used												1435.1680	(219)
Annual totals kWh/year													
Space heating fuel - main system												3000.7477	(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)												255.7738	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.00 * 1004 * 1.00) =												-1606.3939	(233)
Total delivered energy for all uses												3160.2956	(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	3000.7477	0.2160	648.1615	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1435.1680	0.2160	309.9963	(264)
Space and water heating			958.1578	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	255.7738	0.5190	132.7466	(268)
Energy saving/generation technologies				
PV Unit	-1606.3939	0.5190	-833.7184	(269)
Total CO2, kg/year			296.1109	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			5.7700	(273)

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

DER		5.7700	ZC1
Total Floor Area	TFA	51.2800	
Assumed number of occupants	N	1.7278	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3981	ZC2
CO2 emissions from cooking, equation (L16)		3.1292	ZC3
Total CO2 emissions		26.2973	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		26.2973	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	51.2800 (1b)	x 2.3900 (2b)	= 122.5592 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.5592 (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) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (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) =				0.4132 (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	0.5268	0.5165	0.5062	0.4545	0.4442	0.3925	0.3925	0.3822	0.4132	0.4442	0.4648	0.4855 (22b)
Effective ac	0.6388	0.6334	0.6281	0.6033	0.5986	0.5770	0.5770	0.5730	0.5854	0.5986	0.6080	0.6179 (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)			6.8000	1.3258	9.0152		(27)
F1r - Ground			51.2800	0.1300	6.6664		(28a)
W1 - Brick (Timber Frame)	51.3130	6.7980	44.5150	0.1800	8.0127		(29a)
W1 - Clad (Timber Frame)	3.5300		3.5300	0.1800	0.6354		(29a)
W1 - Corridor	14.6080	1.6760	12.9320	0.1800	2.3278		(29a)
Total net area of external elements Aum(A, m ²)			120.7370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.3374		(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)							9.2955 (36)
Total fabric heat loss						(33) + (36) =	37.6329 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	25.8346	25.6167	25.4030	24.3997	24.2120	23.3381	23.3381
Heat transfer coeff	63.4675	63.2496	63.0359	62.0326	61.8449	60.9710	60.9710
Average = Sum(39)m / 12 =							
HLP	1.2377	1.2334	1.2293	1.2097	1.2060	1.1890	1.1890
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7278 (42)
Average daily hot water use (litres/day)												75.2360 (43)
Daily hot water use	82.7595	79.7501	76.7407	73.7312	70.7218	67.7124	67.7124	70.7218	73.7312	76.7407	79.7501	82.7595 (44)
Energy conte	122.7300	107.3405	110.7657	96.5683	92.6595	79.9581	74.0930	85.0228	86.0382	100.2692	109.4517	118.8575 (45)
Energy content (annual)										Total = Sum(45)m =		1183.7545 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	18.4095	16.1011	16.6149	14.4852	13.8989	11.9937	11.1139	12.7534	12.9057	15.0404	16.4178	17.8286 (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)
If cylinder contains dedicated solar storage												

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Combi 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 (57)
Total heat required for water heating calculated for each month	42.1734	36.7069	39.1062	36.3606	36.0391	33.3924	34.5055	36.0391	36.3606	39.1062	39.3288	42.1734 (61)
Solar input	164.9034	144.0474	149.8719	132.9289	128.6986	113.3505	108.5984	121.0618	122.3988	139.3754	148.7805	161.0308 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	164.9034	144.0474	149.8719	132.9289	128.6986	113.3505	108.5984	121.0618	122.3988	139.3754	148.7805	161.0308 (64)
	51.3511	44.8674	46.6062	41.1991	39.8191	34.9342	33.2623	37.2798	37.6979	43.1161	46.2249	50.0634 (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)
(66)m	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	86.3915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.5731	12.9437	10.5265	7.9692	5.9571	5.0292	5.4343	7.0637	9.4808	12.0381	14.0502	14.9781	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.5577	152.1200	148.1830	139.8016	129.2216	119.2779	112.6349	111.0726	115.0096	123.3910	133.9710	143.9147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	31.6391	(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)	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	(71)
Water heating gains (Table 5)	69.0203	66.7670	62.6427	57.2210	53.5202	48.5197	44.7074	50.1073	52.3581	57.9517	64.2012	67.2896	(72)
Total internal gains	286.0685	283.7481	273.2696	256.9093	240.6164	224.7443	214.6940	220.1610	228.7660	245.2982	264.1399	278.0998	(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					3.6350	11.2829	0.6300	0.7000	0.7700		12.5343 (75)	
Southwest					3.1630	36.7938	0.6300	0.7000	0.7700		35.5669 (79)	
Solar gains	48.1012	86.0974	128.8609	178.2010	216.5187	222.3950	211.3155	181.5910	145.7682	98.1377	58.3723	40.6740 (83)
Total gains	334.1696	369.8456	402.1306	435.1102	457.1352	447.1393	426.0095	401.7520	374.5342	343.4360	322.5122	318.7738 (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)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.1092	56.3025	56.4933	57.4071	57.5814	58.4067	58.4067	58.5621	58.0860	57.5814	57.2299	56.8671	
alpha	4.7406	4.7535	4.7662	4.8271	4.8388	4.8938	4.8938	4.9041	4.8724	4.8388	4.8153	4.7911	
util living area	0.9971	0.9948	0.9887	0.9685	0.9085	0.7693	0.6038	0.6556	0.8760	0.9770	0.9946	0.9977	(86)
MIT	19.6900	19.8267	20.0677	20.4036	20.7102	20.9159	20.9799	20.9703	20.8276	20.4423	20.0148	19.6729	(87)
Th 2	19.8900	19.8934	19.8967	19.9123	19.9152	19.9288	19.9288	19.9314	19.9236	19.9152	19.9093	19.9031	(88)
util rest of house	0.9961	0.9930	0.9845	0.9557	0.8694	0.6775	0.4697	0.5227	0.8093	0.9653	0.9923	0.9969	(89)
MIT 2	18.1565	18.3581	18.7106	19.2029	19.6214	19.8703	19.9212	19.9187	19.7801	19.2657	18.6443	18.1407	(90)
Living area fraction	18.8796	19.0506	19.3505	19.7691	20.1348	20.3634	20.4204	20.4146	20.2740	19.8205	19.2905	18.8632	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8796	19.0506	19.3505	19.7691	20.1348	20.3634	20.4204	20.4146	20.2740	19.8205	19.2905	18.8632	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	332.4568	366.5741	394.8099	414.9053	401.5924	320.8837	227.2716	235.3354	312.3862	331.0485	319.4748	317.4620	(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	925.3289	895.0165	810.0417	674.2365	521.6496	351.3982	232.9342	244.1223	378.5133	570.2401	758.5519	918.2318	(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	441.0969	355.1133	308.9324	186.7185	89.3226	0.0000	0.0000	0.0000	0.0000	177.9585	316.1355	446.9727	(98)
Space heating												2322.2504	(98)
Space heating per m2												45.2857	(99)

8c. Space cooling requirement

Not applicable

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

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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													2486.3495 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	441.0969	355.1133	308.9324	186.7185	89.3226	0.0000	0.0000	0.0000	0.0000	177.9585	316.1355	446.9727	(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)	472.2665	380.2070	330.7628	199.9127	95.6344	0.0000	0.0000	0.0000	0.0000	190.5338	338.4749	478.5575	(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	164.9034	144.0474	149.8719	132.9289	128.6986	113.3505	108.5984	121.0618	122.3988	139.3754	148.7805	161.0308	(64)
Efficiency of water heater	87.4083	87.2337	86.8324	85.9065	84.1519	80.3000	80.3000	80.3000	80.3000	85.6675	86.9021	87.4856	(217)
Fuel for water heating, kWh/month	188.6587	165.1281	172.5992	154.7366	152.9360	141.1588	135.2409	150.7619	152.4269	162.6935	171.2048	184.0655	(219)
Water heating fuel used												1931.6109	(219)
Annual totals kWh/year													
Space heating fuel - main system												2486.3495	(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)												257.3652	(232)
Total delivered energy for all uses												4750.3256	(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	2486.3495	0.2160	537.0515 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1931.6109	0.2160	417.2279 (264)
Space and water heating			954.2794 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	257.3652	0.5190	133.5725 (268)
Total CO2, kg/m2/year			1126.7770 (272)
Emissions per m2 for space and water heating			18.6092 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6048 (272b)
Emissions per m2 for pumps and fans			0.7591 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.6092 * 1.00) + 2.6048 + 0.7591, rounded to 2 d.p.			21.9700 (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	51.2800 (1b)	x 2.3900 (2b)	= 122.5592 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.5592 (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) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					3.5300
Number of sides sheltered					0.3397 (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) =				0.3397 (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												
	0.4161	0.3906	0.3821	0.3567	0.3567	0.3482	0.3482	0.3397	0.3397	0.3652	0.3652	0.3737 (22b)
Effective ac	0.5866	0.5763	0.5730	0.5636	0.5636	0.5606	0.5606	0.5577	0.5577	0.5667	0.5667	0.5698 (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)			6.8000	1.3258	9.0152		(27)
Fir - Ground			51.2800	0.2000	10.2560	75.6000	3876.7680 (28a)
Wl - Brick (Timber Frame)	51.3130	6.7980	44.5150	0.2100	9.3482	7.4000	329.4110 (29a)
Wl - Clad (Timber Frame)	3.5300		3.5300	0.2100	0.7413	7.4000	26.1220 (29a)
Wl - Corridor	14.6080	1.6760	12.9320	0.3200	4.1382	13.4400	173.8061 (29a)
Total net area of external elements Aum(A, m ²)			120.7370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5148		(33)
Party Ceiling			51.2780			7.4000	379.4572 (32b)
Stud			105.3791			7.4000	779.8053 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			5565.3696 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							108.5290 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8111 (36)
Total fabric heat loss						(33) + (36) =	46.3259 (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	23.7238	23.3082	23.1755	22.7948	22.7948	22.6738	22.6738	22.5557	22.5557	22.9188	22.9188	23.0457 (38)
Heat transfer coeff	70.0497	69.6341	69.5014	69.1208	69.1208	68.9997	68.9997	68.8816	68.8816	69.2447	69.2447	69.3716 (39)
Average = Sum(39)m / 12 =												69.2542 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3660	1.3579	1.3553	1.3479	1.3479	1.3455	1.3455	1.3432	1.3432	1.3503	1.3503	1.3528 (40)
HLP (average)												1.3505 (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												1.7278 (42)
Average daily hot water use (litres/day)												75.2360 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.7595	79.7501	76.7407	73.7312	70.7218	67.7124	67.7124	70.7218	73.7312	76.7407	79.7501	82.7595 (44)
Energy conte	122.7300	107.3405	110.7657	96.5683	92.6595	79.9581	74.0930	85.0228	86.0382	100.2692	109.4517	118.8575 (45)
Energy content (annual)										Total = Sum(45)m =		1183.7545 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.4095	16.1011	16.6149	14.4852	13.8989	11.9937	11.1139	12.7534	12.9057	15.0404	16.4178	17.8286 (46)
Water storage loss:												

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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	1.1681	0.9844	0.9775	0.8188	0.7536	0.6226	0.5770	0.6915	0.7295	0.8849	1.0038	1.1312 (61)
Total heat required for water heating calculated for each month	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (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	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (64)
RHI water heating demand	41.0997	35.9368	37.0740	32.3136	30.9977	26.7417	24.7802	28.4429	28.7901	33.5607	36.6436	39.8029 (65)
Heat gains from water heating, kWh/month												
	41.0997	35.9368	37.0740	32.3136	30.9977	26.7417	24.7802	28.4429	28.7901	33.5607	36.6436	39.8029 (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	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.2074	32.1591	26.1536	19.7999	14.8007	12.4954	13.5017	17.5500	23.5555	29.9092	34.9084	37.2137	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.7129	227.0448	221.1687	208.6591	192.8681	178.0267	168.1118	165.7800	171.6561	184.1656	199.9567	214.7980	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	(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)	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	(71)
Water heating gains (Table 5)	55.2416	53.4774	49.8306	44.8801	41.6636	37.1413	33.3067	38.2298	39.9862	45.1085	50.8940	53.4985	(72)
Total internal gains	400.8134	397.3327	381.8042	357.9905	333.9837	312.3148	299.5715	306.2111	319.8493	343.8347	370.4104	390.1617	(73)

6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					3.6350	14.6130	0.5000	0.7200			0.7700	13.2520 (75)
Southwest					3.1630	45.0642	0.5000	0.7200			0.7700	35.5604 (79)
Solar gains	48.8124	74.6604	114.4998	160.8766	185.1641	210.2774	193.0105	172.2126	136.9591	93.2100	59.1049	40.5361 (83)
Total gains	449.6257	471.9931	496.3040	518.8671	519.1478	522.5922	492.5821	478.4237	456.8084	437.0447	429.5153	430.6978 (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	22.0691	22.2008	22.2432	22.3657	22.3657	22.4050	22.4050	22.4434	22.4434	22.3257	22.3257	22.2849	
alpha	2.4713	2.4801	2.4829	2.4910	2.4910	2.4937	2.4937	2.4962	2.4962	2.4884	2.4884	2.4857	
util living area	0.9287	0.9174	0.8883	0.8311	0.7313	0.5638	0.4233	0.4223	0.6446	0.8166	0.8992	0.9332 (86)	
MIT	18.9761	19.1250	19.4993	19.9977	20.4824	20.8217	20.9403	20.9427	20.7370	20.2367	19.5744	18.9730 (87)	
Th 2	19.7895	19.7957	19.7977	19.8035	19.8035	19.8053	19.8053	19.8071	19.8071	19.8016	19.8016	19.7997 (88)	
util rest of house	0.9165	0.9034	0.8683	0.7982	0.6720	0.4625	0.2849	0.2796	0.5499	0.7719	0.8788	0.9217 (89)	
MIT 2	18.0110	18.1604	18.5256	19.0053	19.4473	19.7189	19.7899	19.7931	19.6655	19.2356	18.6068	18.0160 (90)	
Living area fraction									fLA = Living area / (4) =			0.4715 (91)	
MIT	18.4661	18.6152	18.9847	19.4733	19.9354	20.2389	20.3324	20.3352	20.1708	19.7077	19.0630	18.4672 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.3161	18.4652	18.8347	19.3233	19.7854	20.0889	20.1824	20.1852	20.0208	19.5577	18.9130	18.3172 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8977	0.8839	0.8488	0.7827	0.6709	0.4885	0.3310	0.3274	0.5687	0.7612	0.8600	0.9034	(94)
Useful gains	403.6434	417.2145	421.2484	406.1064	348.3168	255.2731	163.0584	156.6263	259.7966	332.6933	369.3777	389.0959	(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	883.7536	861.0425	773.8802	637.5198	462.0970	289.0336	171.2831	164.2940	311.3966	502.5549	700.2741	868.3413	(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	357.2020	298.2524	262.3580	166.6176	84.6525	0.0000	0.0000	0.0000	0.0000	126.3770	238.2454	356.5586	(98)
Space heating												1890.2635	(98)
RHI space heating demand												1890	(98)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.2800 (1b)	x 2.3900 (2b)	= 122.5592 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.5592 (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) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					3.5300
Number of sides sheltered					0.3397 (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) =				0.3397 (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	0.4331	0.4246	0.4161	0.3737	0.3652	0.3227	0.3227	0.3142	0.3397	0.3652	0.3821	0.3991 (22b)
	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5797 (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)			6.8000	1.3258	9.0152		(27)
Fir - Ground			51.2800	0.2000	10.2560	75.6000	3876.7680 (28a)
Wl - Brick (Timber Frame)	51.3130	6.7980	44.5150	0.2100	9.3482	7.4000	329.4110 (29a)
Wl - Clad (Timber Frame)	3.5300		3.5300	0.2100	0.7413	7.4000	26.1220 (29a)
Wl - Corridor	14.6080	1.6760	12.9320	0.3200	4.1382	13.4400	173.8061 (29a)
Total net area of external elements Aum(A, m ²)			120.7370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5148		(33)
Party Ceiling			51.2780			7.4000	379.4572 (32b)
Stud			105.3791			7.4000	779.8053 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			5565.3696 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							108.5290 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8111 (36)
Total fabric heat loss						(33) + (36) =	46.3259 (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	24.0155	23.8682	23.7238	23.0457	22.9188	22.3281	22.3281	22.2188	22.5557	22.9188	23.1755	23.4438 (38)
Heat transfer coeff	70.3414	70.1941	70.0497	69.3716	69.2447	68.6541	68.6541	68.5447	68.8816	69.2447	69.5014	69.7697 (39)
Average = Sum(39)m / 12 =												69.3710 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3717	1.3688	1.3660	1.3528	1.3503	1.3388	1.3388	1.3367	1.3432	1.3503	1.3553	1.3606 (40)
HLP (average)												1.3528 (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												1.7278 (42)
Average daily hot water use (litres/day)												75.2360 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.7595	79.7501	76.7407	73.7312	70.7218	67.7124	67.7124	70.7218	73.7312	76.7407	79.7501	82.7595 (44)
Energy conte	122.7300	107.3405	110.7657	96.5683	92.6595	79.9581	74.0930	85.0228	86.0382	100.2692	109.4517	118.8575 (45)
Energy content (annual)										Total = Sum(45)m =		1183.7545 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.4095	16.1011	16.6149	14.4852	13.8989	11.9937	11.1139	12.7534	12.9057	15.0404	16.4178	17.8286 (46)
Water storage loss:												

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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	1.1681	0.9844	0.9775	0.8188	0.7536	0.6226	0.5770	0.6915	0.7295	0.8849	1.0038	1.1312 (61)
Total heat required for water heating calculated for each month	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (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	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (64)
Heat gains from water heating, kWh/month	41.0997	35.9368	37.0740	32.3136	30.9977	26.7417	24.7802	28.4429	28.7901	33.5607	36.6436	39.8029 (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	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.2074	32.1591	26.1536	19.7999	14.8007	12.4954	13.5017	17.5500	23.5555	29.9092	34.9084	37.2137 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.7129	227.0448	221.1687	208.6591	192.8681	178.0267	168.1118	165.7800	171.6561	184.1656	199.9567	214.7980 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948 (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)	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132 (71)
Water heating gains (Table 5)	55.2416	53.4774	49.8306	44.8801	41.6636	37.1413	33.3067	38.2298	39.9862	45.1085	50.8940	53.4985 (72)
Total internal gains	400.8134	397.3327	381.8042	357.9905	333.9837	312.3148	299.5715	306.2111	319.8493	343.8347	370.4104	390.1617 (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				3.6350	11.2829	0.5000		0.7200		0.7700		10.2320 (75)	
Southwest				3.1630	36.7938	0.5000		0.7200		0.7700		29.0342 (79)	
Solar gains	39.2663	70.2836	105.1926	145.4702	176.7500	181.5470	172.5024	148.2375	118.9945	80.1124	47.6508	33.2032	(83)
Total gains	440.0796	467.6163	486.9968	503.4607	510.7337	493.8618	472.0740	454.4487	438.8438	423.9472	418.0613	423.3649	(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	21.9776	22.0237	22.0691	22.2849	22.3257	22.5178	22.5178	22.5537	22.4434	22.3257	22.2432	22.1577
alpha	2.4652	2.4682	2.4713	2.4857	2.4884	2.5012	2.5012	2.5036	2.4962	2.4884	2.4829	2.4772
util living area	0.9425	0.9303	0.9082	0.8649	0.7904	0.6715	0.5445	0.5760	0.7419	0.8694	0.9251	0.9472 (86)
MIT	18.6531	18.8515	19.2260	19.7453	20.2531	20.6639	20.8595	20.8329	20.5335	19.9071	19.2018	18.6104 (87)
Th 2	19.7851	19.7873	19.7895	19.7997	19.8016	19.8106	19.8106	19.8122	19.8071	19.8016	19.7977	19.7937 (88)
util rest of house	0.9333	0.9191	0.8925	0.8395	0.7460	0.5926	0.4271	0.4622	0.6737	0.8399	0.9111	0.9387 (89)
MIT 2	17.6896	17.8857	18.2541	18.7639	19.2421	19.6076	19.7519	19.7378	19.5035	18.9279	18.2408	17.6538 (90)
Living area fraction									fLA = Living area / (4) =			0.4715 (91)
MIT	18.1440	18.3411	18.7124	19.2266	19.7188	20.1057	20.2742	20.2541	19.9892	19.3896	18.6939	18.1049 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.9940	18.1911	18.5624	19.0766	19.5688	19.9557	20.1242	20.1041	19.8392	19.2396	18.5439	17.9549 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	402.9665	420.9623	424.9797	413.4213	375.9106	297.9509	217.4239	223.9109	296.5753	348.9696	373.1137	390.2830 (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	963.2522	932.9566	844.9689	705.9686	544.8711	367.6890	241.9479	253.8996	395.3237	598.2456	795.3682	959.6733 (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	416.8525	344.0601	312.4719	210.6341	125.7066	0.0000	0.0000	0.0000	0.0000	185.4614	304.0233	423.6264 (98)
Space heating												2322.8362 (98)
Space heating per m2										(98) / (4) =		45.2971 (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													2575.2065 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.8525	344.0601	312.4719	210.6341	125.7066	0.0000	0.0000	0.0000	0.0000	185.4614	304.0233	423.6264	(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)	462.1425	381.4414	346.4212	233.5189	139.3643	0.0000	0.0000	0.0000	0.0000	205.6113	337.0546	469.6523	(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	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887	(64)
Efficiency of water heater (217)m	86.5563	86.3990	86.0362	85.2480	83.6483	76.2000	76.2000	76.2000	76.2000	84.7074	85.9898	76.2000	(216)
Fuel for water heating, kWh/month	143.1416	125.3776	129.8794	114.2397	111.6737	105.7490	97.9920	112.4859	113.8684	119.4159	128.4519	138.4197	(219)
Water heating fuel used												1440.6948	(219)
Annual totals kWh/year													
Space heating fuel - main system												2575.2065	(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)												255.7738	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.00 * 1004 * 1.00) =												-1606.3939	(233)
Total delivered energy for all uses												2740.2811	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2575.2065	3.4800	89.6172	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1440.6948	3.4800	50.1362	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	255.7738	13.1900	33.7366	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	0.0000	0.0000	(252)
Total energy cost			303.3824	(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] =	1.3234 (257)
SAP value	81.5380	
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	2575.2065	0.2160	556.2446	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1440.6948	0.2160	311.1901	(264)
Space and water heating			867.4347	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	255.7738	0.5190	132.7466	(268)
Energy saving/generation technologies				
PV Unit	-1606.3939	0.5190	-833.7184	(269)
Total kg/year			205.3878	(272)
CO2 emissions per m2			4.0100	(273)
EI value			97.1415	
EI rating			97	(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
Water heating energy efficiency	$3.48 / 0.8251 = 4.218$, stars = 4
Water heating environmental impact	$0.216 / 0.8251 = 0.2618$, stars = 4

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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	51.2800 (1b)	x 2.3900 (2b)	= 122.5592 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.5592 (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) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					3.5300
Number of sides sheltered					0.3397 (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) =				0.3397 (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												
	0.4161	0.3906	0.3821	0.3567	0.3567	0.3482	0.3482	0.3397	0.3397	0.3652	0.3652	0.3737 (22b)
Effective ac	0.5866	0.5763	0.5730	0.5636	0.5636	0.5606	0.5606	0.5577	0.5577	0.5667	0.5667	0.5698 (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)			6.8000	1.3258	9.0152		(27)
F1r - Ground			51.2800	0.2000	10.2560	75.6000	3876.7680 (28a)
W1 - Brick (Timber Frame)	51.3130	6.7980	44.5150	0.2100	9.3482	7.4000	329.4110 (29a)
W1 - Clad (Timber Frame)	3.5300		3.5300	0.2100	0.7413	7.4000	26.1220 (29a)
W1 - Corridor	14.6080	1.6760	12.9320	0.3200	4.1382	13.4400	173.8061 (29a)
Total net area of external elements Aum(A, m ²)			120.7370				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5148		(33)
Party Ceiling			51.2780			7.4000	379.4572 (32b)
Stud			105.3791			7.4000	779.8053 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			5565.3696 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							108.5290 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8111 (36)
Total fabric heat loss						(33) + (36) =	46.3259 (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	23.7238	23.3082	23.1755	22.7948	22.7948	22.6738	22.6738	22.5557	22.5557	22.9188	22.9188	23.0457 (38)
Heat transfer coeff	70.0497	69.6341	69.5014	69.1208	69.1208	68.9997	68.9997	68.8816	68.8816	69.2447	69.2447	69.3716 (39)
Average = Sum(39)m / 12 =												69.2542 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3660	1.3579	1.3553	1.3479	1.3479	1.3455	1.3455	1.3432	1.3432	1.3503	1.3503	1.3528 (40)
HLP (average)												1.3505 (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												1.7278 (42)
Average daily hot water use (litres/day)												75.2360 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.7595	79.7501	76.7407	73.7312	70.7218	67.7124	67.7124	70.7218	73.7312	76.7407	79.7501	82.7595 (44)
Energy conte	122.7300	107.3405	110.7657	96.5683	92.6595	79.9581	74.0930	85.0228	86.0382	100.2692	109.4517	118.8575 (45)
Energy content (annual)										Total = Sum(45)m =		1183.7545 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.4095	16.1011	16.6149	14.4852	13.8989	11.9937	11.1139	12.7534	12.9057	15.0404	16.4178	17.8286 (46)
Water storage loss:												

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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	1.1681	0.9844	0.9775	0.8188	0.7536	0.6226	0.5770	0.6915	0.7295	0.8849	1.0038	1.1312 (61)
Total heat required for water heating calculated for each month	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (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	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887 (64)
Heat gains from water heating, kWh/month	41.0997	35.9368	37.0740	32.3136	30.9977	26.7417	24.7802	28.4429	28.7901	33.5607	36.6436	39.8029 (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	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698	103.6698 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.2074	32.1591	26.1536	19.7999	14.8007	12.4954	13.5017	17.5500	23.5555	29.9092	34.9084	37.2137 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.7129	227.0448	221.1687	208.6591	192.8681	178.0267	168.1118	165.7800	171.6561	184.1656	199.9567	214.7980 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948	47.0948 (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)	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132	-69.1132 (71)
Water heating gains (Table 5)	55.2416	53.4774	49.8306	44.8801	41.6636	37.1413	33.3067	38.2298	39.9862	45.1085	50.8940	53.4985 (72)
Total internal gains	400.8134	397.3327	381.8042	357.9905	333.9837	312.3148	299.5715	306.2111	319.8493	343.8347	370.4104	390.1617 (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				3.6350	14.6130	0.5000	0.7200	0.7700				13.2520 (75)
Southwest				3.1630	45.0642	0.5000	0.7200	0.7700				35.5604 (79)
Solar gains	48.8124	74.6604	114.4998	160.8766	185.1641	210.2774	193.0105	172.2126	136.9591	93.2100	59.1049	40.5361 (83)
Total gains	449.6257	471.9931	496.3040	518.8671	519.1478	522.5922	492.5821	478.4237	456.8084	437.0447	429.5153	430.6978 (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	22.0691	22.2008	22.2432	22.3657	22.3657	22.4050	22.4050	22.4434	22.4434	22.3257	22.3257	22.2849
alpha	2.4713	2.4801	2.4829	2.4910	2.4910	2.4937	2.4937	2.4962	2.4962	2.4884	2.4884	2.4857
util living area	0.9287	0.9174	0.8883	0.8311	0.7313	0.5638	0.4233	0.4223	0.6446	0.8166	0.8992	0.9332 (86)
MIT	18.9761	19.1250	19.4993	19.9977	20.4824	20.8217	20.9403	20.9427	20.7370	20.2367	19.5744	18.9730 (87)
Th 2	19.7895	19.7957	19.7977	19.8035	19.8035	19.8053	19.8053	19.8071	19.8071	19.8016	19.8016	19.7997 (88)
util rest of house	0.9165	0.9034	0.8683	0.7982	0.6720	0.4625	0.2849	0.2796	0.5499	0.7719	0.8788	0.9217 (89)
MIT 2	18.0110	18.1604	18.5256	19.0053	19.4473	19.7189	19.7899	19.7931	19.6655	19.2356	18.6068	18.0160 (90)
Living area fraction									fLA = Living area / (4) =			0.4715 (91)
MIT	18.4661	18.6152	18.9847	19.4733	19.9354	20.2389	20.3324	20.3352	20.1708	19.7077	19.0630	18.4672 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3161	18.4652	18.8347	19.3233	19.7854	20.0889	20.1824	20.1852	20.0208	19.5577	18.9130	18.3172 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	403.6434	417.2145	421.2484	406.1064	348.3168	255.2731	163.0584	156.6263	259.7966	332.6933	369.3777	389.0959 (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	883.7536	861.0425	773.8802	637.5198	462.0970	289.0336	171.2831	164.2940	311.3966	502.5549	700.2741	868.3413 (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	357.2020	298.2524	262.3580	166.6176	84.6525	0.0000	0.0000	0.0000	0.0000	126.3770	238.2454	356.5586 (98)
Space heating												1890.2635 (98)
Space heating per m2										(98) / (4) =		36.8616 (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													2095.6359 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	357.2020	298.2524	262.3580	166.6176	84.6525	0.0000	0.0000	0.0000	0.0000	126.3770	238.2454	356.5586	(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)	396.0111	330.6568	290.8625	184.7202	93.8498	0.0000	0.0000	0.0000	0.0000	140.1076	264.1301	395.2978	(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	123.8981	108.3249	111.7433	97.3871	93.4131	80.5808	74.6699	85.7143	86.7677	101.1541	110.4555	119.9887	(64)
Efficiency of water heater (217)m	86.1250	85.9907	85.5074	84.4748	82.2705	76.2000	76.2000	76.2000	76.2000	83.3888	85.2393	76.2000	(216)
Fuel for water heating, kWh/month	143.8585	125.9728	130.6825	115.2853	113.5439	105.7490	97.9920	112.4859	113.8684	121.3042	129.5829	139.1789	(219)
Water heating fuel used												1449.5045	(219)
Annual totals kWh/year													
Space heating fuel - main system												2095.6359	(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)												255.7738	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.00 * 1130 * 1.00) =												-1807.3468	(233)
Total delivered energy for all uses												2068.5673	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2095.6359	5.7300	120.0799 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1449.5045	5.7300	83.0566 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	255.7738	24.1800	61.8461 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (252)
Total energy cost			397.1176 (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	2095.6359	0.2160	452.6573 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1449.5045	0.2160	313.0930 (264)
Space and water heating			765.7503 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	255.7738	0.5190	132.7466 (268)
Energy saving/generation technologies			
PV Unit	-1807.3468	0.5190	-938.0130 (269)
Total kg/year			-0.5911 (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	2095.6359	1.2200	2556.6757 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1449.5045	1.2200	1768.3955 (264)
Space and water heating			4325.0712 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	255.7738	3.0700	785.2255 (268)
Energy saving/generation technologies			
PV Unit	-1807.3468	3.0700	-5548.5547 (269)
Primary energy kWh/year			-208.0080 (272)
Primary energy kWh/m2/year			-4.0563 (273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Current energy efficiency rating: B 82
Current environmental impact rating: A 97

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

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

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

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 97

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	£80	£80	£0
Mains gas	£317	£317	£0
Space heating	£252	£252	£0
Water heating	£83	£83	£0
Lighting	£62	£62	£0
Total cost of fuels	£397	£397	£0
Total cost of uses	£397	£397	£0
Delivered energy	40 kWh/m²	40 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	0 kg/m²	0 kg/m²	0 kg/m²
Primary energy	-4 kWh/m²	-4 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	063 - PRJ013014	Issued on Date	26/03/2025
Assessment Reference	063	Prop Type Ref	1BF
Property	Flat 1, Willoughby House, Caveney View, Netley Abbey, SO31 5JR		
SAP Rating	82 B	DER	5.77
Environmental	97 A	TER	21.97
CO ₂ Emissions (t/year)	0.00	% DER<TER	73.74
General Requirements Compliance	Pass	DFEE	56.59
		TFEE	58.44
		% DFEE<TFEE	3.18
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)	21.97	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	5.77	kgCO ₂ /m ²	Pass
	-16.20 (-73.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.44	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	56.59	kWh/m ² /yr	
	-1.8 (-3.1%)	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	0.20 (max. 0.25)	0.20 (max. 0.70)	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	3.53 (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
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

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)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North East

3.64 m², No overhang

Windows facing South West

3.16 m², No overhang

Air change rate

5.28 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

3.53 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Air permeability

3.5

m³/m²h

Photovoltaic array

2.00

kW

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