

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	064 - PRJ013014			Issued on Date	26/03/2025
Assessment Reference	064	Prop Type Ref	1BF		
Property	Flat 2, Willoughby House, Caveney View, Netley Abbey, SO31 5JR				
SAP Rating	82 B	DER	10.99	TER	21.19
Environmental	93 A	% DER<TER	48.13		
CO ₂ Emissions (t/year)	0.32	DFEE	51.51	TFEE	54.39
General Requirements Compliance	Pass	% DFEE<TFEE	5.30		
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) 21.19 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.99 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 51.5 kWh/m²/yr OK

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	0.19 (max. 0.25)	0.19 (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: 3.44 (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: 3.64 m², No overhang
Windows facing South East: 3.06 m², No overhang
Air change rate: 5.28 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
Air permeability: 3.4 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	51.4500 (1b)	x 2.3900 (2b)	= 122.9655 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.9655 (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) =	0.1626 (8)
Pressure test					Yes
Measured/design AP50					3.4400
Infiltration rate					0.3346 (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) =		0.3346 (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	0.4267	0.4183	0.4099	0.3681	0.3597	0.3179	0.3179	0.3095	0.3346	0.3597	0.3765	0.3932 (22b)
Effective ac	0.5910	0.5875	0.5840	0.5678	0.5647	0.5505	0.5505	0.5479	0.5560	0.5647	0.5709	0.5773 (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)			6.7000	1.3258	8.8826		(27)
F1r - Ground			51.4500	0.1900	9.7755	75.6000	3889.6200 (28a)
W1 - Brick (Timber Frame)	36.3400	6.7000	29.6400	0.2100	6.2244	7.4000	219.3360 (29a)
W1 - Clad (Timber Frame)	3.5400		3.5400	0.2100	0.7434	18.0000	63.7200 (29a)
W1 - Corridor	15.6900	1.6760	14.0140	0.3200	4.4845	13.4400	188.3482 (29a)
Total net area of external elements Aum(A, m ²)			107.0240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.1264		(33)
Party Ceiling			51.4510			7.4000	380.7374 (32b)
Stud			105.9967			7.4000	784.3759 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5526.1375 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							107.4079 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9801 (36)
Total fabric heat loss							(33) + (36) = 43.1065 (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	23.9830	23.8396	23.6990	23.0386	22.9151	22.3399	22.3399	22.2334	22.5615	22.9151	23.1650	23.4263 (38)
Heat transfer coeff	67.0895	66.9460	66.8054	66.1451	66.0215	65.4464	65.4464	65.3399	65.6679	66.0215	66.2715	66.5328 (39)
Average = Sum(39)m / 12 =												66.1445 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3040	1.3012	1.2985	1.2856	1.2832	1.2720	1.2720	1.2700	1.2763	1.2832	1.2881	1.2932 (40)
HLP (average)												1.2856 (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												1.7328 (42)
Average daily hot water use (litres/day)												75.3551 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.8906	79.8764	76.8622	73.8480	70.8338	67.8196	67.8196	70.8338	73.8480	76.8622	79.8764	82.8906 (44)
Energy content (annual)	122.9243	107.5104	110.9411	96.7211	92.8062	80.0847	74.2103	85.1574	86.1744	100.4280	109.6250	119.0456 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1185.6285 (45)
Water storage loss:	18.4386	16.1266	16.6412	14.5082	13.9209	12.0127	11.1315	12.7736	12.9262	15.0642	16.4437	17.8568 (46)

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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	1.1718	0.9876	0.9806	0.8214	0.7560	0.6246	0.5788	0.6937	0.7318	0.8877	1.0070	1.1348 (61)
Total heat required for water heating calculated for each month	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (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	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (64)
Heat gains from water heating, kWh/month	41.1653	35.9941	37.1331	32.3651	31.0471	26.7843	24.8196	28.4882	28.8360	33.6142	36.7021	39.8664 (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	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.5825	12.9520	10.5333	7.9744	5.9609	5.0325	5.4378	7.0682	9.4870	12.0459	14.0593	14.9878 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.9989	152.5658	148.6173	140.2113	129.6003	119.6275	112.9650	111.3981	115.3466	123.7526	134.3636	144.3364 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642 (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)	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138 (71)
Water heating gains (Table 5)	55.3297	53.5626	49.9100	44.9516	41.7299	37.2004	33.3597	38.2907	40.0499	45.1804	50.9751	53.5838 (72)
Total internal gains	272.9037	271.0732	261.0533	245.1300	229.2839	213.8531	203.7552	208.7497	216.8762	232.9716	251.3907	264.9007 (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					3.6360	11.2829	0.7300		0.7200	0.7700		14.9429 (75)
Southeast					3.0640	36.7938	0.7300		0.7200	0.7700		41.0632 (77)
Solar gains	56.0061	100.3625	150.5040	208.5798	253.7968	260.8335	247.7792	212.6889	170.4021	114.4766	67.9862	47.3446 (83)
Total gains	328.9098	371.4356	411.5573	453.7097	483.0806	474.6866	451.5344	421.4386	387.2783	347.4481	319.3769	312.2454 (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	22.8805	22.9295	22.9777	23.2071	23.2506	23.4549	23.4549	23.4931	23.3758	23.2506	23.1629	23.0719
alpha	2.5254	2.5286	2.5318	2.5471	2.5500	2.5637	2.5637	2.5662	2.5584	2.5500	2.5442	2.5381
util living area	0.9676	0.9546	0.9308	0.8822	0.7982	0.6731	0.5464	0.5905	0.7728	0.9045	0.9548	0.9714 (86)
MIT	18.4630	18.7105	19.1446	19.7273	20.2728	20.6826	20.8683	20.8347	20.5093	19.8146	19.0412	18.4153 (87)
Th 2	19.8377	19.8399	19.8420	19.8521	19.8540	19.8628	19.8628	19.8644	19.8594	19.8540	19.8502	19.8462 (88)
util rest of house	0.9622	0.9470	0.9186	0.8599	0.7560	0.5972	0.4336	0.4805	0.7104	0.8818	0.9459	0.9666 (89)
MIT 2	17.5417	17.7873	18.2159	18.7887	19.3029	19.6680	19.8061	19.7881	19.5305	18.8843	18.1246	17.5003 (90)
Living area fraction									fLA = Living area / (4) =			0.4783 (91)
MIT	17.9824	18.2289	18.6601	19.2376	19.7668	20.1533	20.3142	20.2888	19.9987	19.3293	18.5630	17.9380 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.8324	18.0789	18.5101	19.0876	19.6168	20.0033	20.1642	20.1388	19.8487	19.1793	18.4130	17.7880 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	312.2977	346.1126	370.7137	381.9506	360.3769	288.3766	210.3477	214.7239	274.8607	300.5467	297.3997	298.1570 (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	907.8809	882.2764	802.3415	673.8620	522.6803	353.6261	233.2638	244.2897	377.5036	566.4184	749.7306	904.0462 (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	443.1140	360.3021	321.1310	210.1762	120.7537	0.0000	0.0000	0.0000	0.0000	197.8085	325.6783	450.7816 (98)
Space heating												2429.7454 (98)
Space heating per m2										(98) / (4) =		47.2254 (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													2693.7310 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	443.1140	360.3021	321.1310	210.1762	120.7537	0.0000	0.0000	0.0000	0.0000	197.8085	325.6783	450.7816	(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)	491.2572	399.4480	356.0211	233.0113	133.8733	0.0000	0.0000	0.0000	0.0000	219.2999	361.0624	499.7578	(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	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804	(64)
Efficiency of water heater (217)m	86.7144	86.5210	86.1111	85.2360	83.5024	76.2000	76.2000	76.2000	76.2000	84.9157	86.1850	76.2000	(216)
Fuel for water heating, kWh/month	143.1090	125.4007	129.9736	114.4383	112.0473	105.9177	98.1484	112.6654	114.0502	119.3132	128.3658	138.3903	(219)
Water heating fuel used												1441.8199	(219)
Annual totals kWh/year													
Space heating fuel - main system												2693.7310	(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)												257.5313	(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												3504.2459	(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	2693.7310	0.2160	581.8459	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1441.8199	0.2160	311.4331	(264)
Space and water heating			893.2790	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	257.5313	0.5190	133.6588	(268)
Energy saving/generation technologies				
PV Unit	-963.8364	0.5190	-500.2311	(269)
Total CO2, kg/year			565.6317	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.9900	(273)

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

DER		10.9900	ZC1
Total Floor Area	TFA	51.4500	
Assumed number of occupants	N	1.7328	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3914	ZC2
CO2 emissions from cooking, equation (L16)		3.1212	ZC3
Total CO2 emissions		31.5027	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.5027	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	51.4500 (1b)	x 2.3900 (2b)	= 122.9655 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.9655 (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) = 0.1626 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4126 (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) =				0.4126 (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	0.5261	0.5158	0.5055	0.4539	0.4436	0.3920	0.3920	0.3817	0.4126	0.4436	0.4642	0.4849 (22b)
Effective ac	0.6384	0.6330	0.6278	0.6030	0.5984	0.5768	0.5768	0.5728	0.5851	0.5984	0.6078	0.6175 (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)			6.7000	1.3258	8.8826		(27)
F1r - Ground			51.4500	0.1300	6.6885		(28a)
W1 - Brick (Timber Frame)	36.3400	6.7000	29.6400	0.1800	5.3352		(29a)
W1 - Clad (Timber Frame)	3.5400		3.5400	0.1800	0.6372		(29a)
W1 - Corridor	15.6900	1.6760	14.0140	0.1800	2.5225		(29a)
Total net area of external elements Aum(A, m ²)			107.0240				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7460		(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)							8.7444 (36)
Total fabric heat loss						(33) + (36) =	34.4904 (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	25.9055	25.6875	25.4737	24.4696	24.2818	23.4073	23.4073	23.2453	23.7441	24.2818	24.6618	25.0591 (38)
Heat transfer coeff	60.3959	60.1779	59.9641	58.9600	58.7722	57.8977	57.8977	57.7357	58.2345	58.7722	59.1522	59.5495 (39)
Average = Sum(39)m / 12 =												58.9591 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1739	1.1696	1.1655	1.1460	1.1423	1.1253	1.1253	1.1222	1.1319	1.1423	1.1497	1.1574 (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												1.7328 (42)
Average daily hot water use (litres/day)												75.3551 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.8906	79.8764	76.8622	73.8480	70.8338	67.8196	67.8196	70.8338	73.8480	76.8622	79.8764	82.8906 (44)
Energy content (annual)	122.9243	107.5104	110.9411	96.7211	92.8062	80.0847	74.2103	85.1574	86.1744	100.4280	109.6250	119.0456 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1185.6285 (45)
Water storage loss:	18.4386	16.1266	16.6412	14.5082	13.9209	12.0127	11.1315	12.7736	12.9262	15.0642	16.4437	17.8568 (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	42.2401	36.7650	39.1681	36.4182	36.0961	33.4453	34.5601	36.0961	36.4182	39.1681	39.3911	42.2401 (61)
Solar input	165.1644	144.2754	150.1092	133.1393	128.9023	113.5300	108.7704	121.2535	122.5926	139.5961	149.0161	161.2858 (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	165.1644	144.2754	150.1092	133.1393	128.9023	113.5300	108.7704	121.2535	122.5926	139.5961	149.0161	161.2858 (64)
	51.4324	44.9385	46.6799	41.2643	39.8821	34.9895	33.3149	37.3389	37.7575	43.1843	46.2981	50.1427 (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	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	86.6422	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6735	13.0329	10.5991	8.0242	5.9982	5.0639	5.4717	7.1124	9.5462	12.1211	14.1471	15.0814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.9989	152.5658	148.6173	140.2113	129.6003	119.6275	112.9650	111.3981	115.3466	123.7526	134.3636	144.3364	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	31.6642	(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)	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	(71)
Water heating gains (Table 5)	69.1295	66.8727	62.7419	57.3116	53.6050	48.5965	44.7781	50.1866	52.4410	58.0435	64.3029	67.3961	(72)
Total internal gains	286.7946	284.4641	273.9509	257.5397	241.1961	225.2806	215.2076	220.6898	229.3265	245.9098	264.8062	278.8066	(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				3.6360	11.2829	0.6300		0.7000	0.7700		12.5377 (75)	
Southeast				3.0640	36.7938	0.6300		0.7000	0.7700		34.4537 (77)	
Solar gains	46.9914	84.2082	126.2791	175.0070	212.9459	218.8501	207.8969	178.4548	142.9743	96.0506	57.0432	39.7241 (83)
Total gains	333.7860	368.6723	400.2300	432.5468	454.1420	444.1306	423.1045	399.1445	372.3009	341.9604	321.8495	318.5307 (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	59.1582	59.3726	59.5843	60.5990	60.7927	61.7109	61.7109	61.8840	61.3539	60.7927	60.4021	59.9991	
alpha	4.9439	4.9582	4.9723	5.0399	5.0528	5.1141	5.1141	5.1256	5.0903	5.0528	5.0268	4.9999	
util living area	0.9972	0.9948	0.9885	0.9668	0.9016	0.7526	0.5834	0.6353	0.8660	0.9759	0.9945	0.9978	(86)
MIT	19.7718	19.9049	20.1375	20.4607	20.7494	20.9334	20.9855	20.9780	20.8545	20.4927	20.0834	19.7557	(87)
Th 2	19.9410	19.9444	19.9477	19.9635	19.9664	19.9802	19.9802	19.9828	19.9749	19.9664	19.9604	19.9542	(88)
util rest of house	0.9962	0.9931	0.9843	0.9536	0.8616	0.6628	0.4577	0.5095	0.7986	0.9638	0.9923	0.9970	(89)
MIT 2	18.3115	18.5079	18.8481	19.3219	19.7133	19.9342	19.9747	19.9734	19.8547	19.3750	18.7804	18.2973	(90)
Living area fraction									fLA = Living area / (4) =			0.4783	(91)
MIT	19.0100	19.1761	19.4649	19.8666	20.2089	20.4122	20.4582	20.4539	20.3329	19.9096	19.4037	18.9949	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0100	19.1761	19.4649	19.8666	20.2089	20.4122	20.4582	20.4539	20.3329	19.9096	19.4037	18.9949	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9950	0.9913	0.9818	0.9521	0.8723	0.7033	0.5183	0.5700	0.8250	0.9630	0.9907	0.9960	(94)
Ext temp.	332.1331	365.4783	392.9392	411.8428	396.1294	312.3557	219.2751	227.5306	307.1551	329.2954	318.8570	317.2715	(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	888.4243	859.1049	777.4263	646.5898	500.0858	336.5116	223.3790	234.0555	362.9724	547.1473	727.7887	881.0279	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	413.8806	331.7171	286.0584	169.0179	77.3436	0.0000	0.0000	0.0000	0.0000	162.0818	294.4309	419.4348	(98)
												2153.9650	(98)
												41.8652	(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													2306.1724 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	413.8806	331.7171	286.0584	169.0179	77.3436	0.0000	0.0000	0.0000	0.0000	162.0818	294.4309	419.4348	(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)	443.1270	355.1575	306.2724	180.9613	82.8089	0.0000	0.0000	0.0000	0.0000	173.5351	315.2365	449.0736	(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	165.1644	144.2754	150.1092	133.1393	128.9023	113.5300	108.7704	121.2535	122.5926	139.5961	149.0161	161.2858	(64)
Efficiency of water heater (217)m	87.2691	87.0802	86.6492	85.6530	83.8115	80.3000	80.3000	80.3000	80.3000	85.4279	86.7340	87.3487	(217)
Fuel for water heating, kWh/month	189.2588	165.6811	173.2379	155.4404	153.8003	141.3823	135.4550	151.0006	152.6682	163.4080	171.8080	184.6459	(219)
Water heating fuel used												1937.7865	(219)
Annual totals kWh/year													
Space heating fuel - main system												2306.1724	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												259.1392	(232)
Total delivered energy for all uses												4578.0981	(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	2306.1724	0.2160	498.1332 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1937.7865	0.2160	418.5619 (264)
Space and water heating			916.6951 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	259.1392	0.5190	134.4932 (268)
Total CO2, kg/m2/year			1090.1134 (272)
Emissions per m2 for space and water heating			17.8172 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6141 (272b)
Emissions per m2 for pumps and fans			0.7566 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.8172 * 1.00) + 2.6141 + 0.7566, rounded to 2 d.p.			21.1900 (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	51.4500 (1b)	x 2.3900 (2b)	= 122.9655 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.9655 (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) = 0.1626 (8)
Measured/design AP50					Yes
Infiltration rate					3.4400
Number of sides sheltered					0.3346 (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) =				0.3346 (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												
	0.4099	0.3848	0.3765	0.3514	0.3514	0.3430	0.3430	0.3346	0.3346	0.3597	0.3597	0.3681 (22b)
Effective ac	0.5840	0.5741	0.5709	0.5617	0.5617	0.5588	0.5588	0.5560	0.5560	0.5647	0.5647	0.5678 (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)			6.7000	1.3258	8.8826		(27)
Flr - Ground			51.4500	0.1900	9.7755	75.6000	3889.6200 (28a)
Wl - Brick (Timber Frame)	36.3400	6.7000	29.6400	0.2100	6.2244	7.4000	219.3360 (29a)
Wl - Clad (Timber Frame)	3.5400		3.5400	0.2100	0.7434	18.0000	63.7200 (29a)
Wl - Corridor	15.6900	1.6760	14.0140	0.3200	4.4845	13.4400	188.3482 (29a)
Total net area of external elements Aum(A, m ²)			107.0240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.1264		(33)
Party Ceiling			51.4510			7.4000	380.7374 (32b)
Stud			105.9967			7.4000	784.3759 (32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			5526.1375 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							107.4079 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9801 (36)
Total fabric heat loss						(33) + (36) =	43.1065 (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	23.6990	23.2943	23.1650	22.7944	22.7944	22.6765	22.6765	22.5615	22.5615	22.9151	22.9151	23.0386 (38)
Heat transfer coeff	66.8054	66.4007	66.2715	65.9008	65.9008	65.7830	65.7830	65.6679	65.6679	66.0215	66.0215	66.1451 (39)
Average = Sum(39)m / 12 =												66.0308 (39)
HLP	1.2985	1.2906	1.2881	1.2809	1.2809	1.2786	1.2786	1.2763	1.2763	1.2832	1.2832	1.2856 (40)
HLP (average)												1.2834 (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												1.7328 (42)
Average daily hot water use (litres/day)												75.3551 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.8906	79.8764	76.8622	73.8480	70.8338	67.8196	67.8196	70.8338	73.8480	76.8622	79.8764	82.8906 (44)
Energy conte	122.9243	107.5104	110.9411	96.7211	92.8062	80.0847	74.2103	85.1574	86.1744	100.4280	109.6250	119.0456 (45)
Energy content (annual)										Total = Sum(45)m =		1185.6285 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.4386	16.1266	16.6412	14.5082	13.9209	12.0127	11.1315	12.7736	12.9262	15.0642	16.4437	17.8568 (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	1.1718	0.9876	0.9806	0.8214	0.7560	0.6246	0.5788	0.6937	0.7318	0.8877	1.0070	1.1348 (61)
Total heat required for water heating calculated for each month	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (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	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (64)
RHI water heating demand	41.1653	35.9941	37.1331	32.3651	31.0471	26.7843	24.8196	28.4882	28.8360	33.6142	36.7021	39.8664 (65)
Heat gains from water heating, kWh/month												
	41.1653	35.9941	37.1331	32.3651	31.0471	26.7843	24.8196	28.4882	28.8360	33.6142	36.7021	39.8664 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.4562	32.3801	26.3333	19.9360	14.9024	12.5812	13.5944	17.6706	23.7174	30.1147	35.1483	37.4695 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	225.3715	227.7102	221.8168	209.2706	193.4333	178.5485	168.6045	166.2659	172.1592	184.7054	200.5427	215.4275 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299 (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)	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138 (71)
Water heating gains (Table 5)	55.3297	53.5626	49.9100	44.9516	41.7299	37.2004	33.3597	38.2907	40.0499	45.1804	50.9751	53.5838 (72)
Total internal gains	401.9442	398.4397	382.8469	358.9450	334.8524	313.1170	300.3454	307.0139	320.7133	344.7873	371.4529	391.2676 (73)

6. Solar gains												
[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
Northeast		3.6360	14.6130	0.7300	0.7200	0.7700	19.3532 (75)					
Southeast		3.0640	45.0642	0.7300	0.7200	0.7700	50.2931 (77)					
Solar gains	69.6464	106.6583	163.9006	230.7734	265.9731	302.2028	277.3271	247.1899	196.2232	133.2540	84.3602	57.8195 (83)
Total gains	471.5906	505.0980	546.7475	589.7184	600.8255	615.3198	577.6725	554.2038	516.9366	478.0413	455.8130	449.0871 (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	22.9777	23.1178	23.1629	23.2932	23.2932	23.3349	23.3349	23.3758	23.3758	23.2506	23.2506	23.2071
alpha	2.5318	2.5412	2.5442	2.5529	2.5529	2.5557	2.5557	2.5584	2.5584	2.5500	2.5500	2.5471
util living area	0.9187	0.9023	0.8619	0.7853	0.6654	0.4857	0.3559	0.3588	0.5820	0.7807	0.8828	0.9246 (86)
MIT	19.1343	19.3051	19.6962	20.1868	20.6150	20.8833	20.9635	20.9640	20.8075	20.3595	19.7168	19.1226 (87)
Th 2	19.8420	19.8482	19.8502	19.8558	19.8558	19.8577	19.8577	19.8594	19.8594	19.8540	19.8540	19.8521 (88)
util rest of house	0.9057	0.8868	0.8394	0.7488	0.6047	0.3947	0.2405	0.2390	0.4917	0.7334	0.8608	0.9123 (89)
MIT 2	18.2019	18.3714	18.7495	19.2144	19.5950	19.8019	19.8481	19.8505	19.7571	19.3823	18.7797	18.1986 (90)
Living area fraction									fLA = Living area / (4) =			0.4783 (91)
MIT	18.6479	18.8180	19.2023	19.6796	20.0829	20.3191	20.3816	20.3831	20.2595	19.8497	19.2279	18.6406 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4979	18.6680	19.0523	19.5296	19.9329	20.1691	20.2316	20.2331	20.1095	19.6997	19.0779	18.4906 (93)

8. Space heating requirement												
Utilisation	0.8867	0.8674	0.8209	0.7371	0.6092	0.4208	0.2796	0.2797	0.5130	0.7261	0.8427	0.8939 (94)
Useful gains	418.1708	438.1196	448.8322	434.6707	366.0175	258.9229	161.5425	155.0028	265.2128	347.0927	384.1061	401.4596 (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	854.9702	834.5257	752.3355	621.4154	450.2945	280.8361	166.5379	159.7796	302.6976	488.5428	678.5656	839.4199 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	324.9787	266.3849	225.8065	134.4562	62.7021	0.0000	0.0000	0.0000	0.0000	105.2388	212.0108	325.8425 (98)
Space heating												1657.4206 (98)
RHI space heating demand												1657 (98)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.4500 (1b)	x 2.3900 (2b)	= 122.9655 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.9655 (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) = 0.1626 (8)
Measured/design AP50					Yes
Infiltration rate					3.4400
Number of sides sheltered					0.3346 (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) =				0.3346 (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	0.4267	0.4183	0.4099	0.3681	0.3597	0.3179	0.3179	0.3095	0.3346	0.3597	0.3765	0.3932 (22b)
Effective ac	0.5910	0.5875	0.5840	0.5678	0.5647	0.5505	0.5505	0.5479	0.5560	0.5647	0.5709	0.5773 (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)			6.7000	1.3258	8.8826		(27)
F1r - Ground			51.4500	0.1900	9.7755	75.6000	3889.6200 (28a)
W1 - Brick (Timber Frame)	36.3400	6.7000	29.6400	0.2100	6.2244	7.4000	219.3360 (29a)
W1 - Clad (Timber Frame)	3.5400		3.5400	0.2100	0.7434	18.0000	63.7200 (29a)
W1 - Corridor	15.6900	1.6760	14.0140	0.3200	4.4845	13.4400	188.3482 (29a)
Total net area of external elements Aum(A, m ²)			107.0240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.1264		(33)
Party Ceiling			51.4510			7.4000	380.7374 (32b)
Stud			105.9967			7.4000	784.3759 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5526.1375 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							107.4079 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9801 (36)
Total fabric heat loss						(33) + (36) =	43.1065 (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	23.9830	23.8396	23.6990	23.0386	22.9151	22.3399	22.3399	22.2334	22.5615	22.9151	23.1650	23.4263 (38)
Heat transfer coeff	67.0895	66.9460	66.8054	66.1451	66.0215	65.4464	65.4464	65.3399	65.6679	66.0215	66.2715	66.5328 (39)
Average = Sum(39)m / 12 =												66.1445 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3040	1.3012	1.2985	1.2856	1.2832	1.2720	1.2720	1.2700	1.2763	1.2832	1.2881	1.2932 (40)
HLP (average)												1.2856 (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												1.7328 (42)
Average daily hot water use (litres/day)												75.3551 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.8906	79.8764	76.8622	73.8480	70.8338	67.8196	67.8196	70.8338	73.8480	76.8622	79.8764	82.8906 (44)
Energy conte	122.9243	107.5104	110.9411	96.7211	92.8062	80.0847	74.2103	85.1574	86.1744	100.4280	109.6250	119.0456 (45)
Energy content (annual)										Total = Sum(45)m =		1185.6285 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.4386	16.1266	16.6412	14.5082	13.9209	12.0127	11.1315	12.7736	12.9262	15.0642	16.4437	17.8568 (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	1.1718	0.9876	0.9806	0.8214	0.7560	0.6246	0.5788	0.6937	0.7318	0.8877	1.0070	1.1348 (61)
Total heat required for water heating calculated for each month	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (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	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (64)
Heat gains from water heating, kWh/month	41.1653	35.9941	37.1331	32.3651	31.0471	26.7843	24.8196	28.4882	28.8360	33.6142	36.7021	39.8664 (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	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.4562	32.3801	26.3333	19.9360	14.9024	12.5812	13.5944	17.6706	23.7174	30.1147	35.1483	37.4695 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	225.3715	227.7102	221.8168	209.2706	193.4333	178.5485	168.6045	166.2659	172.1592	184.7054	200.5427	215.4275 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299 (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)	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138 (71)
Water heating gains (Table 5)	55.3297	53.5626	49.9100	44.9516	41.7299	37.2004	33.3597	38.2907	40.0499	45.1804	50.9751	53.5838 (72)
Total internal gains	401.9442	398.4397	382.8469	358.9450	334.8524	313.1170	300.3454	307.0139	320.7133	344.7873	371.4529	391.2676 (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				3.6360	11.2829	0.7300	0.7200	0.7700	14.9429 (75)			
Southeast				3.0640	36.7938	0.7300	0.7200	0.7700	41.0632 (77)			
Solar gains	56.0061	100.3625	150.5040	208.5798	253.7968	260.8335	247.7792	212.6889	170.4021	114.4766	67.9862	47.3446 (83)
Total gains	457.9503	498.8022	533.3510	567.5248	588.6492	573.9505	548.1246	519.7028	491.1154	459.2639	439.4391	438.6122 (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	22.8805	22.9295	22.9777	23.2071	23.2506	23.4549	23.4549	23.4931	23.3758	23.2506	23.1629	23.0719
alpha	2.5254	2.5286	2.5318	2.5471	2.5500	2.5637	2.5637	2.5662	2.5584	2.5500	2.5442	2.5381
util living area	0.9355	0.9180	0.8871	0.8280	0.7333	0.5994	0.4721	0.5086	0.6895	0.8438	0.9142	0.9413 (86)
MIT	18.8114	19.0376	19.4300	19.9488	20.4195	20.7609	20.9067	20.8842	20.6347	20.0478	19.3489	18.7630 (87)
Th 2	19.8377	19.8399	19.8420	19.8521	19.8540	19.8628	19.8628	19.8644	19.8594	19.8540	19.8502	19.8462 (88)
util rest of house	0.9257	0.9056	0.8692	0.7992	0.6855	0.5228	0.3676	0.4048	0.6202	0.8117	0.8991	0.9323 (89)
MIT 2	17.8815	18.1037	18.4869	18.9905	19.4249	19.7210	19.8243	19.8134	19.6245	19.0958	18.4202	17.8403 (90)
Living area fraction	18.3263	18.5504	18.9380	19.4489	19.9006	20.2184	20.3421	20.3256	20.1077	19.5511	18.8644	18.2816 (91)
MIT	18.1763	18.4004	18.7880	19.2989	19.7506	20.0684	20.1921	20.1756	19.9577	19.4011	18.7144	18.1316 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.7009	442.1201	453.1656	444.4840	400.7285	308.5899	218.9732	226.1010	307.8218	365.9332	386.9352	401.3855 (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	930.9552	903.8003	820.9060	687.8344	531.5134	357.8886	235.0878	246.6957	384.6615	581.0648	769.7038	926.9095 (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	383.3492	310.2491	273.5989	175.2122	97.3040	0.0000	0.0000	0.0000	0.0000	160.0579	275.5934	390.9899 (98)
Space heating												2066.3546 (98)
Space heating per m2												(98) / (4) = 40.1624 (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													2290.8587 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.3492	310.2491	273.5989	175.2122	97.3040	0.0000	0.0000	0.0000	0.0000	160.0579	275.5934	390.9899	(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)	424.9991	343.9568	303.3247	194.2486	107.8758	0.0000	0.0000	0.0000	0.0000	177.4478	305.5359	433.4699	(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	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804	(64)
Efficiency of water heater (217)m	86.3215	86.1012	85.6325	84.6389	82.7475	76.2000	76.2000	76.2000	76.2000	84.2032	85.6903	76.2000	(216)
Fuel for water heating, kWh/month	143.7603	126.0121	130.7000	115.2456	113.0695	105.9177	98.1484	112.6654	114.0502	120.3228	129.1067	138.9930	(219)
Water heating fuel used												1447.9917	(219)
Annual totals kWh/year													
Space heating fuel - main system												2290.8587	(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)												257.5313	(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												3107.5454	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2290.8587	3.4800	79.7219	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1447.9917	3.4800	50.3901	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	257.5313	13.1900	33.9684	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	0.0000	0.0000	0.0000	(252)
Total energy cost			293.9729	(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] =	1.2801 (257)
SAP value	82.1422	
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	2290.8587	0.2160	494.8255	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1447.9917	0.2160	312.7662	(264)
Space and water heating			807.5917	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	257.5313	0.5190	133.6588	(268)
Energy saving/generation technologies				
PV Unit	-963.8364	0.5190	-500.2311	(269)
Total kg/year			479.9444	(272)
CO2 emissions per m2			9.3300	(273)
EI value			93.3320	
EI rating			93	(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	$3.48 / 0.8222 = 4.233$, stars = 4
Water heating environmental impact	$0.216 / 0.8222 = 0.2627$, 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	51.4500 (1b)	x 2.3900 (2b)	= 122.9655 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 122.9655 (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) = 0.1626 (8)
Pressure test					Yes
Measured/design AP50					3.4400
Infiltration rate					0.3346 (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) =				0.3346 (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												
	0.4099	0.3848	0.3765	0.3514	0.3514	0.3430	0.3430	0.3346	0.3346	0.3597	0.3597	0.3681 (22b)
Effective ac	0.5840	0.5741	0.5709	0.5617	0.5617	0.5588	0.5588	0.5560	0.5560	0.5647	0.5647	0.5678 (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)			6.7000	1.3258	8.8826		(27)
Fir - Ground			51.4500	0.1900	9.7755	75.6000	3889.6200 (28a)
Wl - Brick (Timber Frame)	36.3400	6.7000	29.6400	0.2100	6.2244	7.4000	219.3360 (29a)
Wl - Clad (Timber Frame)	3.5400		3.5400	0.2100	0.7434	18.0000	63.7200 (29a)
Wl - Corridor	15.6900	1.6760	14.0140	0.3200	4.4845	13.4400	188.3482 (29a)
Total net area of external elements Aum(A, m ²)			107.0240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.1264		(33)
Party Ceiling			51.4510			7.4000	380.7374 (32b)
Stud			105.9967			7.4000	784.3759 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5526.1375 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							107.4079 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9801 (36)
Total fabric heat loss							(33) + (36) = 43.1065 (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	23.6990	23.2943	23.1650	22.7944	22.7944	22.6765	22.6765	22.5615	22.5615	22.9151	22.9151	23.0386 (38)
Heat transfer coeff	66.8054	66.4007	66.2715	65.9008	65.9008	65.7830	65.7830	65.6679	65.6679	66.0215	66.0215	66.1451 (39)
Average = Sum(39)m / 12 =												66.0308 (39)
HLP	1.2985	1.2906	1.2881	1.2809	1.2809	1.2786	1.2786	1.2763	1.2763	1.2832	1.2832	1.2856 (40)
HLP (average)												1.2834 (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												1.7328 (42)
Average daily hot water use (litres/day)												75.3551 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.8906	79.8764	76.8622	73.8480	70.8338	67.8196	67.8196	70.8338	73.8480	76.8622	79.8764	82.8906 (44)
Energy conte	122.9243	107.5104	110.9411	96.7211	92.8062	80.0847	74.2103	85.1574	86.1744	100.4280	109.6250	119.0456 (45)
Energy content (annual)										Total = Sum(45)m =		1185.6285 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.4386	16.1266	16.6412	14.5082	13.9209	12.0127	11.1315	12.7736	12.9262	15.0642	16.4437	17.8568 (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	1.1718	0.9876	0.9806	0.8214	0.7560	0.6246	0.5788	0.6937	0.7318	0.8877	1.0070	1.1348 (61)
Total heat required for water heating calculated for each month	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (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	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804 (64)
Heat gains from water heating, kWh/month	41.1653	35.9941	37.1331	32.3651	31.0471	26.7843	24.8196	28.4882	28.8360	33.6142	36.7021	39.8664 (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	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	103.9707	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.4562	32.3801	26.3333	19.9360	14.9024	12.5812	13.5944	17.6706	23.7174	30.1147	35.1483	37.4695	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	225.3715	227.7102	221.8168	209.2706	193.4333	178.5485	168.6045	166.2659	172.1592	184.7054	200.5427	215.4275	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	47.1299	(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)	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	-69.3138	(71)
Water heating gains (Table 5)	55.3297	53.5626	49.9100	44.9516	41.7299	37.2004	33.3597	38.2907	40.0499	45.1804	50.9751	53.5838	(72)
Total internal gains	401.9442	398.4397	382.8469	358.9450	334.8524	313.1170	300.3454	307.0139	320.7133	344.7873	371.4529	391.2676	(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				3.6360	14.6130	0.7300		0.7200		0.7700		19.3532 (75)	
Southeast				3.0640	45.0642	0.7300		0.7200		0.7700		50.2931 (77)	

Solar gains	69.6464	106.6583	163.9006	230.7734	265.9731	302.2028	277.3271	247.1899	196.2232	133.2540	84.3602	57.8195	(83)
Total gains	471.5906	505.0980	546.7475	589.7184	600.8255	615.3198	577.6725	554.2038	516.9366	478.0413	455.8130	449.0871	(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	22.9777	23.1178	23.1629	23.2932	23.2932	23.3349	23.3349	23.3758	23.3758	23.2506	23.2506	23.2071	
alpha	2.5318	2.5412	2.5442	2.5529	2.5529	2.5557	2.5557	2.5584	2.5584	2.5500	2.5500	2.5471	
util living area	0.9187	0.9023	0.8619	0.7853	0.6654	0.4857	0.3559	0.3588	0.5820	0.7807	0.8828	0.9246	(86)
MIT	19.1343	19.3051	19.6962	20.1868	20.6150	20.8833	20.9635	20.9640	20.8075	20.3595	19.7168	19.1226	(87)
Th 2	19.8420	19.8482	19.8502	19.8558	19.8558	19.8577	19.8577	19.8594	19.8594	19.8540	19.8540	19.8521	(88)
util rest of house	0.9057	0.8868	0.8394	0.7488	0.6047	0.3947	0.2405	0.2390	0.4917	0.7334	0.8608	0.9123	(89)
MIT 2	18.2019	18.3714	18.7495	19.2144	19.5950	19.8019	19.8481	19.8505	19.7571	19.3823	18.7797	18.1986	(90)
Living area fraction									fLA = Living area / (4) =			0.4783	(91)
MIT	18.6479	18.8180	19.2023	19.6796	20.0829	20.3191	20.3816	20.3831	20.2595	19.8497	19.2279	18.6406	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4979	18.6680	19.0523	19.5296	19.9329	20.1691	20.2316	20.2331	20.1095	19.6997	19.0779	18.4906	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.8867	0.8674	0.8209	0.7371	0.6092	0.4208	0.2796	0.2797	0.5130	0.7261	0.8427	0.8939	(94)
Ext temp.	418.1708	438.1196	448.8322	434.6707	366.0175	258.9229	161.5425	155.0028	265.2128	347.0927	384.1061	401.4596	(95)
Heat loss rate W	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)
Month fracti	854.9702	834.5257	752.3355	621.4154	450.2945	280.8361	166.5379	159.7796	302.6976	488.5428	678.5656	839.4199	(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	324.9787	266.3849	225.8065	134.4562	62.7021	0.0000	0.0000	0.0000	0.0000	105.2388	212.0108	325.8425	(98)
Space heating per m2												1657.4206	(98)
										(98) / (4) =		32.2142	(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													1837.4951 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	324.9787	266.3849	225.8065	134.4562	62.7021	0.0000	0.0000	0.0000	0.0000	105.2388	212.0108	325.8425	(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)	360.2869	295.3269	250.3398	149.0645	69.5145	0.0000	0.0000	0.0000	0.0000	116.6728	235.0453	361.2445	(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	124.0961	108.4980	111.9217	97.5425	93.5622	80.7093	74.7890	85.8510	86.9063	101.3157	110.6320	120.1804	(64)
Efficiency of water heater (217)m	85.8418	85.6459	85.0232	83.7320	81.2609	76.2000	76.2000	76.2000	76.2000	82.7433	84.8543	76.2000	(216)
Fuel for water heating, kWh/month	144.5638	126.6821	131.6366	116.4938	115.1381	105.9177	98.1484	112.6654	114.0502	122.4458	130.3788	139.8337	(219)
Water heating fuel used												1457.9543	(219)
Annual totals kWh/year													
Space heating fuel - main system												1837.4951	(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)												257.5313	(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												2543.5726	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1837.4951	5.7300	105.2885 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1457.9543	5.7300	83.5408 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	257.5313	24.1800	62.2711 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (252)
Total energy cost			383.2353 (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	1837.4951	0.2160	396.8989 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1457.9543	0.2160	314.9181 (264)
Space and water heating			711.8171 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	257.5313	0.5190	133.6588 (268)
Energy saving/generation technologies			
PV Unit	-1084.4081	0.5190	-562.8078 (269)
Total kg/year			321.5930 (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	1837.4951	1.2200	2241.7440 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1457.9543	1.2200	1778.7042 (264)
Space and water heating			4020.4482 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	257.5313	3.0700	790.6211 (268)
Energy saving/generation technologies			
PV Unit	-1084.4081	3.0700	-3329.1328 (269)
Primary energy kWh/year			1712.1865 (272)
Primary energy kWh/m2/year			33.2786 (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 93

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

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

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

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

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

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

	Current	Potential	Saving
Electricity	£80	£80	£0
Mains gas	£303	£303	£0
Space heating	£237	£237	£0
Water heating	£84	£84	£0
Lighting	£62	£62	£0
Total cost of fuels	£383	£383	£0
Total cost of uses	£383	£383	£0
Delivered energy	49 kWh/m²	49 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	064 - PRJ013014			Issued on Date	26/03/2025
Assessment Reference	064	Prop Type Ref	1BF		
Property	Flat 2, Willoughby House, Caveney View, Netley Abbey, SO31 5JR				
SAP Rating	82 B	DER	10.99	TER	21.19
Environmental	93 A	% DER<TER	48.13		
CO ₂ Emissions (t/year)	0.32	DFEE	51.51	TFEE	54.39
General Requirements Compliance	Pass	% DFEE<TFEE	5.30		
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)	21.19	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.99	kgCO ₂ /m ²	Pass
	-10.20 (-48.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.39	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	51.51	kWh/m ² /yr	
	-2.9 (-5.3%)	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	0.19 (max. 0.25)	0.19 (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	3.44 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

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

Calculation Type: New Build (As Built)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

3.64 m², No overhang

Windows facing South East

3.06 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

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.44 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Air permeability

3.4

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.