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SAP Calculations Report – Energy Statement

Project: Flat 1 – 10, 18 Parkside Road, Reading,
Client: Country Estates
Project Ref: J03207
Date: 18th September 2024
Submitted by: Tom Pope

Flat 1-10, 18 Parkside Road, Reading.

This report identifies a solution in order to comply with Planning Condition 18

The development hereby permitted shall not be occupied until written verification has been submitted to and approved in writing by the Local Planning Authority demonstrating that all of the dwellings hereby permitted have achieved a minimum of a 35% improvement in the dwelling emission rate over the target emission rate, as defined in The Building Regulations for England Approved Document L1a: Conservation of Fuel and Power in New Dwellings (2013 edition) and a S106 contribution has been made to the Local Authority to account for any remaining emissions. Such evidence shall be in the form of an 'As Built' Standard Assessment Procedure (SAP) assessment, produced by an accredited energy assessor. REASON: To ensure that the development is carried out in accordance with sustainable building standards in accordance with Policy CC2 and H5 of the Reading Borough Local Plan 2019.

SAP Ratings have been calculated as instructed in accordance with Approved Document L1 2013

	DER	TER	Floor Area (m2)	% reduction
Flat 1	14.26	20.89	68	31.75
Flat 4	14.09	18.95	72	25.66
Flat 8	8.42	17.22	69	51.10
Total			209	108.51

Average CO2 emission per	0.519
Overall reduction in CO2 apportioned over all 10	35.2%

Total development area over 10 flats 678m2

Attached Full SAP calculations for sample flats

Appendix

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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Property Reference	J02855 Flat 1			Issued on Date	17/09/2024
Assessment Reference	J02855 Flat 1	Prop Type Ref	As Built		
Property	Flat 1, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	88 B	DER	14.26	TER	20.89
Environmental	91 B	% DER<TER	31.75		
CO ₂ Emissions (t/year)	0.68	DFEE	49.75	TFEE	56.42
General Requirements Compliance	Pass	% DFEE<TFEE	11.83		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, stephen@energyreport.co.uk			Assessor ID	w557-0001
Client	Country Estates, Country Estates				

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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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 68 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.89 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.26 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.32 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.40 (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 835 VUW 356/6-3 (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: Time and temperature zone control 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 (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 0.72 m², No overhang
Windows facing East: 1.80 m², No overhang
Windows facing South: 0.90 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Photovoltaic array 1.22 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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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	68.0000 (1b)	x 2.7000 (2b)	= 183.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.6000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	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) =	0.1089 (8)
Measured/design AP50				Yes	4.4000
Infiltration rate					0.3289 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3043 (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	0.3879	0.3803	0.3727	0.3347	0.3271	0.2890	0.2890	0.2814	0.3043	0.3271	0.3423	0.3575 (22b)
Effective ac	0.5752	0.5723	0.5695	0.5560	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5639 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1 (Uw = 1.32)			3.4200	1.2538	4.2880		(27)
Opening Type 2			8.0800	1.2000	9.6960		(26)
Heat Loss Floor 1			68.0000	0.1300	8.8400		(28a)
External Wall 1	67.4700	11.5000	55.9700	0.1500	8.3955		(29a)
Total net area of external elements Aum(A, m ²)			135.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2195		(33)
Party Wall 1			33.3100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6827 (36)
Total fabric heat loss						(33) + (36) =	41.9022 (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	34.8530	34.6760	34.5025	33.6874	33.5349	32.8251	32.8251	32.6936	33.0985	33.5349	33.8434	34.1659 (38)
Heat transfer coeff	76.7552	76.5782	76.4047	75.5896	75.4371	74.7272	74.7272	74.5958	75.0007	75.4371	75.7456	76.0681 (39)
Average = Sum(39)m / 12 =												75.5889 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1288	1.1262	1.1236	1.1116	1.1094	1.0989	1.0989	1.0970	1.1030	1.1094	1.1139	1.1186 (40)
HLP (average)												1.1116 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1966 (42)
Average daily hot water use (litres/day)												86.3694 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	95.0064	91.5516	88.0968	84.6420	81.1872	77.7325	77.7325	81.1872	84.6420	88.0968	91.5516	95.0064 (44)
Energy content (annual)	140.8917	123.2248	127.1569	110.8585	106.3713	91.7904	85.0573	97.6045	98.7702	115.1071	125.6484	136.4461 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1358.9271 (45)
Water storage loss:	21.1338	18.4837	19.0735	16.6288	15.9557	13.7686	12.7586	14.6407	14.8155	17.2661	18.8473	20.4669 (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	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	0.6024	0.5077	0.5041	0.4222	0.3886	0.3211	0.2975	0.3566	0.3762	0.4563	0.5176	0.5833 (61)
Total heat required for water heating calculated for each month												
	141.4940	123.7324	127.6610	111.2807	106.7600	92.1115	85.3548	97.9611	99.1464	115.5635	126.1661	137.0294 (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								Solar input (sum of months) = Sum (63)m =				
	141.4940	123.7324	127.6610	111.2807	106.7600	92.1115	85.3548	97.9611	99.1464	115.5635	126.1661	137.0294 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) = Sum (64)m =				
	46.9971	41.0991	42.4057	36.9660	35.4656	30.6006	28.3559	32.5426	32.9351	38.3872	41.9075	45.5142 (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	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	22.3015	19.8080	16.1090	12.1955	9.1163	7.6964	8.3162	10.8097	14.5088	18.4222	21.5014	22.9214 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	192.5849	194.5833	189.5473	178.8263	165.2930	152.5736	144.0762	142.0778	147.1138	157.8348	171.3681	184.0875 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830 (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)												
	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643 (71)
Water heating gains (Table 5)												
	63.1681	61.1594	56.9969	51.3417	47.6689	42.5008	38.1128	43.7401	45.7432	51.5957	58.2049	61.1749 (72)
Total internal gains	337.0036	334.4999	321.6023	301.3126	281.0273	261.7199	249.4543	255.5767	266.3149	286.8018	310.0235	327.1329 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	0.7200	10.6334	0.7600		0.7000	0.7700	2.8226 (74)
East	1.8000	19.6403	0.7600		0.7000	0.7700	13.0336 (76)
South	0.9000	46.7521	0.7600		0.7000	0.7700	15.5127 (78)

Solar gains	31.3689	56.2965	83.5176	112.5382	132.9985	134.7398	128.8046	113.3601	93.6620	64.0774	38.1213	26.4757 (83)
Total gains	368.3726	390.7964	405.1199	413.8508	414.0257	396.4597	378.2589	368.9368	359.9769	350.8791	348.1448	353.6086 (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	61.5231	61.6654	61.8054	62.4718	62.5981	63.1928	63.1928	63.3041	62.9624	62.5981	62.3432	62.0788
alpha	5.1015	5.1110	5.1204	5.1648	5.1732	5.2129	5.2129	5.2203	5.1975	5.1732	5.1562	5.1386
util living area	0.9988	0.9981	0.9963	0.9908	0.9721	0.9065	0.7751	0.8073	0.9484	0.9913	0.9978	0.9990 (86)
MIT	19.9965	20.0700	20.2140	20.4211	20.6354	20.8236	20.9107	20.9006	20.7638	20.4918	20.2117	19.9838 (87)
Th 2	19.9774	19.9795	19.9816	19.9914	19.9932	20.0017	20.0017	20.0033	19.9984	19.9932	19.9895	19.9856 (88)
util rest of house	0.9983	0.9974	0.9949	0.9866	0.9566	0.8465	0.6417	0.6846	0.9115	0.9865	0.9968	0.9987 (89)
MIT 2	18.6269	18.7361	18.9481	19.2573	19.5655	19.8212	19.9078	19.9022	19.7471	19.3623	18.9514	18.6149 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.1860	19.2806	19.4649	19.7324	20.0023	20.2304	20.3172	20.3098	20.1621	19.8234	19.4659	19.1737 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0360	19.1306	19.3149	19.5824	19.8523	20.0804	20.1672	20.1598	20.0121	19.6734	19.3159	19.0237 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9978	0.9966	0.9936	0.9843	0.9538	0.8523	0.6668	0.7070	0.9122	0.9844	0.9960	0.9982 (94)
Useful gains	367.5595	389.4673	402.5183	407.3550	394.8909	337.9194	252.2407	260.8225	328.3706	345.3984	346.7358	352.9813 (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												
	1131.0656	1089.7570	979.1164	807.4779	614.9836	409.5375	266.5696	280.4663	443.4137	684.4728	925.2998	1127.6143 (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												
	568.0486	470.5947	428.9890	288.0885	163.7490	0.0000	0.0000	0.0000	0.0000	252.2713	416.5661	576.3269 (98)
Space heating												3164.6341 (98)
Space heating per m2												46.5387 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3508.4635 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	568.0486	470.5947	428.9890	288.0885	163.7490	0.0000	0.0000	0.0000	0.0000	252.2713	416.5661	576.3269	(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)	629.7656	521.7236	475.5975	319.3886	181.5399	0.0000	0.0000	0.0000	0.0000	279.6800	461.8249	638.9434	(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	141.4940	123.7324	127.6610	111.2807	106.7600	92.1115	85.3548	97.9611	99.1464	115.5635	126.1661	137.0294	(64)
Efficiency of water heater (217)m	87.0639	86.9310	86.6121	85.8777	84.1978	76.4000	76.4000	76.4000	76.4000	85.3562	86.5652	87.1753	(217)
Fuel for water heating, kWh/month	162.5174	142.3341	147.3940	129.5804	126.7967	120.5647	111.7210	128.2213	129.7728	135.3897	145.7470	157.1884	(219)
Water heating fuel used												1637.2273	(219)
Annual totals kWh/year													
Space heating fuel - main system												3508.4635	(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)												393.8519	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.22 * 951 * 0.80) =										-742.2410		-742.2410	(233)
Total delivered energy for all uses												4872.3018	(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	3508.4635	0.2160	757.8281	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1637.2273	0.2160	353.6411	(264)
Space and water heating			1111.4692	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	393.8519	0.5190	204.4092	(268)
Energy saving/generation technologies				
PV Unit	-742.2410	0.5190	-385.2231	(269)
Total CO2, kg/year			969.5803	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2600	(273)

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

DER			14.2600	ZC1
Total Floor Area		TFA	68.0000	
Assumed number of occupants		N	2.1966	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.7826	ZC2
CO2 emissions from cooking, equation (L16)			2.5253	ZC3
Total CO2 emissions			33.5679	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			33.5679	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	68.0000 (1b)	x 2.7000 (2b)	= 183.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.6000 (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 20.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3589 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3320 (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	0.4233	0.4150	0.4067	0.3652	0.3569	0.3154	0.3154	0.3071	0.3320	0.3569	0.3735	0.3901 (22b)
Effective ac	0.5896	0.5861	0.5827	0.5667	0.5637	0.5497	0.5497	0.5472	0.5551	0.5637	0.5698	0.5761 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			8.0800	1.0000	8.0800			(26)					
TER Opening Type (Uw = 1.40)			3.4200	1.3258	4.5341			(27)					
Heat Loss Floor 1			68.0000	0.1300	8.8400			(28a)					
External Wall 1	67.4700	11.5000	55.9700	0.1800	10.0746			(29a)					
Total net area of external elements Aum(A, m2)			135.4700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5287			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.0059 (36)					
Total fabric heat loss						(33) + (36) =		39.5346 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.7226	Feb 35.5118	Mar 35.3052	Apr 34.3346	May 34.1531	Jun 33.3078	Jul 33.3078	Aug 33.1513	Sep 33.6334	Oct 34.1531	Nov 34.5204	Dec 34.9044	(38)
Heat transfer coeff	75.2572	75.0464	74.8397	73.8692	73.6877	72.8424	72.8424	72.6858	73.1680	73.6877	74.0550	74.4390	(39)
Average = Sum(39)m / 12 =												73.8684	(39)
HLP	Jan 1.1067	Feb 1.1036	Mar 1.1006	Apr 1.0863	May 1.0836	Jun 1.0712	Jul 1.0712	Aug 1.0689	Sep 1.0760	Oct 1.0836	Nov 1.0890	Dec 1.0947	(40)
HLP (average)												1.0863	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1966 (42)
Average daily hot water use (litres/day)												86.3694 (43)
Daily hot water use	95.0064	91.5516	88.0968	84.6420	81.1872	77.7325	77.7325	81.1872	84.6420	88.0968	91.5516	95.0064 (44)
Energy conte	140.8917	123.2248	127.1569	110.8585	106.3713	91.7904	85.0573	97.6045	98.7702	115.1071	125.6484	136.4461 (45)
Energy content (annual)										Total = Sum(45)m =		1358.9271 (45)
Distribution loss (46)m = 0.15 x (45)m	21.1338	18.4837	19.0735	16.6288	15.9557	13.7686	12.7586	14.6407	14.8155	17.2661	18.8473	20.4669 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	48.4142	42.1388	44.8932	41.7413	41.3721	38.3338	39.6116	41.3721	41.7413	44.8932	45.1487	48.4142 (61)

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Total heat required for water heating calculated for each month												
	189.3059	165.3636	172.0501	152.5997	147.7435	130.1242	124.6689	138.9766	140.5115	160.0003	170.7972	184.8603 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
	189.3059	165.3636	172.0501	152.5997	147.7435	130.1242	124.6689	138.9766	140.5115	160.0003	170.7972	184.8603 (64)
Total per year (kWh/year) = Sum (64)m =												1877.0016 (64)
Heat gains from water heating, kWh/month												
	58.9500	51.5069	53.5030	47.2958	45.7115	40.1038	38.1845	42.7965	43.2764	49.4964	53.0653	57.4719 (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	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	22.3015	19.8080	16.1090	12.1955	9.1163	7.6964	8.3162	10.8097	14.5088	18.4222	21.5014	22.9214 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	192.5849	194.5833	189.5473	178.8263	165.2930	152.5736	144.0762	142.0778	147.1138	157.8348	171.3681	184.0875 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830 (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)												
	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643 (71)
Water heating gains (Table 5)												
	79.2339	76.6472	71.9126	65.6886	61.4402	55.6997	51.3232	57.5222	60.1061	66.5274	73.7018	77.2471 (72)
Total internal gains	353.0694	349.9877	336.5180	315.6595	294.7986	274.9187	262.6647	269.3588	280.6778	301.7335	325.5204	343.2051 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				0.7200	10.6334	0.6300	0.7000	0.7700	2.3398 (74)			
East				1.8000	19.6403	0.6300	0.7000	0.7700	10.8042 (76)			
South				0.9000	46.7521	0.6300	0.7000	0.7700	12.8592 (78)			
Solar gains	26.0032	46.6668	69.2317	93.2882	110.2487	111.6922	106.7722	93.9696	77.6409	53.1168	31.6005	21.9470 (83)
Total gains	379.0726	396.6545	405.7497	408.9478	405.0473	386.6109	369.4369	363.3284	358.3186	354.8503	357.1210	365.1521 (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	62.7478	62.9241	63.0978	63.9268	64.0843	64.8280	64.8280	64.9676	64.5395	64.0843	63.7664	63.4375
alpha	5.1832	5.1949	5.2065	5.2618	5.2723	5.3219	5.3219	5.3312	5.3026	5.2723	5.2511	5.2292
util living area	0.9986	0.9979	0.9963	0.9911	0.9735	0.9091	0.7765	0.8051	0.9467	0.9907	0.9975	0.9989 (86)
MIT	19.7774	19.8684	20.0510	20.3174	20.5932	20.8393	20.9529	20.9413	20.7681	20.4201	20.0599	19.7641 (87)
Th 2	19.9953	19.9979	20.0004	20.0120	20.0142	20.0244	20.0244	20.0263	20.0205	20.0142	20.0098	20.0052 (88)
util rest of house												
	0.9981	0.9972	0.9948	0.9870	0.9587	0.8508	0.6456	0.6840	0.9094	0.9855	0.9964	0.9985 (89)
MIT 2	18.3584	18.4933	18.7619	19.1582	19.5548	19.8886	20.0020	19.9954	19.8004	19.3099	18.7821	18.3461 (90)
Living area fraction												fLA = Living area / (4) =
MIT	18.9377	19.0547	19.2882	19.6314	19.9787	20.2767	20.3902	20.3816	20.1955	19.7631	19.3037	0.4082 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	18.9377	19.0547	19.2882	19.6314	19.9787	20.2767	20.3902	20.3816	20.1955	19.7631	19.3037	18.9250 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9974	0.9962	0.9934	0.9849	0.9580	0.8687	0.6997	0.7334	0.9177	0.9837	0.9954	0.9979 (94)
Useful gains	378.0846	395.1621	403.0553	402.7669	388.0326	335.8496	258.4888	266.4582	328.8285	349.0831	355.4676	364.3746 (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												
	1101.5926	1062.2577	957.0623	792.7206	610.0401	413.5034	276.0850	289.4040	445.9927	675.2063	903.7460	1096.1111 (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												
	538.2899	448.2883	412.1812	280.7667	165.1736	0.0000	0.0000	0.0000	0.0000	242.6356	394.7605	544.4119 (98)
Space heating												3026.5077 (98)
Space heating per m2												(98) / (4) =
												44.5075 (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													3240.3722 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	538.2899	448.2883	412.1812	280.7667	165.1736	0.0000	0.0000	0.0000	0.0000	242.6356	394.7605	544.4119	(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)	576.3276	479.9660	441.3075	300.6067	176.8454	0.0000	0.0000	0.0000	0.0000	259.7812	422.6557	582.8822	(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	189.3059	165.3636	172.0501	152.5997	147.7435	130.1242	124.6689	138.9766	140.5115	160.0003	170.7972	184.8603	(64)
Efficiency of water heater	87.5354	87.4364	87.1711	86.5660	85.3324	80.3000	80.3000	80.3000	80.3000	86.0967	87.0918	87.6068	(216)
(217)m	87.5354	87.4364	87.1711	86.5660	85.3324	80.3000	80.3000	80.3000	80.3000	86.0967	87.0918	87.6068	(217)
Fuel for water heating, kWh/month	216.2621	189.1243	197.3704	176.2814	173.1387	162.0476	155.2539	173.0717	174.9831	185.8379	196.1116	211.0112	(219)
Water heating fuel used												2210.4940	(219)
Annual totals kWh/year													
Space heating fuel - main system												3240.3722	(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)												393.8519	(232)
Total delivered energy for all uses												5919.7182	(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	3240.3722	0.2160	699.9204 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2210.4940	0.2160	477.4667 (264)
Space and water heating			1177.3871 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.8519	0.5190	204.4092 (268)
Total CO2, kg/m2/year			1420.7213 (272)
Emissions per m2 for space and water heating			17.3145 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.0060 (272b)
Emissions per m2 for pumps and fans			0.5724 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.3145 * 1.00) + 3.0060 + 0.5724, rounded to 2 d.p.			20.8900 (273)

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Property Reference	J02855 Flat 4			Issued on Date	17/09/2024
Assessment Reference	J02855 Flat 4	Prop Type Ref	As Built		
Property	Flat 4, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	87 B	DER	14.09	TER	18.95
Environmental	90 B	% DER<TER	25.66		
CO ₂ Emissions (t/year)	0.75	DFEE	43.94	TFEE	51.47
General Requirements Compliance	Pass	% DFEE<TFEE	14.62		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, stephen@energyreport.co.uk			Assessor ID	w557-0001
Client	Country Estates, Country Estates				

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

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

DWELLING AS BUILT

Mid-floor flat, total floor area 72 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) 18.95 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.09 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 43.9 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.96 (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 835 VUW 356/6-3 (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: Time and temperature zone control 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 (Thames Valley): Slight OK
Based on:
Overshading:
Average
Windows facing East: 1.79 m², No overhang
Windows facing South: 2.69 m², No overhang
Windows facing West: 5.83 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Photovoltaic array 0.80 kW

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Calculation Type: New Build (As Built)



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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	72.0000 (1b)	x 2.7000 (2b)	= 194.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.4000 (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					3 * 10 = 30.0000 (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 30.0000 / (5) = 0.1543 (8)
Pressure test					Yes
Measured/design AP50					4.9600
Infiltration rate					0.4023 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3721 (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	0.4745	0.4652	0.4559	0.4094	0.4001	0.3535	0.3535	0.3442	0.3721	0.4001	0.4187	0.4373 (22b)
Effective ac	0.6126	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1 (Uw = 1.30)			6.2700	1.2357	7.7481		(27)					
Opening Type 2 (Uw = 1.20)			4.0400	1.1450	4.6260		(27)					
Heat Loss Floor 1			3.1400	0.1500	0.4710		(28a)					
External Wall 1	61.0200	10.3100	50.7100	0.1500	7.6065		(29a)					
Total net area of external elements Aum(A, m2)			64.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.4516		(33)					
Party Wall 1			52.5900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.7475 (36)					
Total fabric heat loss						(33) + (36) =	42.1991 (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	39.2975	39.0171	38.7422	37.4512	37.2096	36.0852	36.0852	35.8770	36.5183	37.2096	37.6983	38.2092 (38)
Heat transfer coeff	81.4966	81.2162	80.9413	79.6503	79.4087	78.2842	78.2842	78.0760	78.7174	79.4087	79.8974	80.4082 (39)
Average = Sum(39)m / 12 =												79.6491 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1319	1.1280	1.1242	1.1063	1.1029	1.0873	1.0873	1.0844	1.0933	1.1029	1.1097	1.1168 (40)
HLP (average)												1.1062 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937 (42)
Average daily hot water use (litres/day)												88.6750 (43)
Daily hot water use	Jan 97.5425	Feb 93.9955	Mar 90.4485	Apr 86.9015	May 83.3545	Jun 79.8075	Jul 79.8075	Aug 83.3545	Sep 86.9015	Oct 90.4485	Nov 93.9955	Dec 97.5425 (44)
Energy conte	144.6527	126.5142	130.5513	113.8178	109.2109	94.2407	87.3279	100.2100	101.4068	118.1799	129.0026	140.0884 (45)
Energy content (annual)										Total = Sum(45)m =		1395.2031 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6979	18.9771	19.5827	17.0727	16.3816	14.1361	13.0992	15.0315	15.2110	17.7270	19.3504	21.0133 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	0.6349	0.5351	0.5314	0.4451	0.4096	0.3385	0.3136	0.3759	0.3966	0.4810	0.5457	0.6149 (61)
Total heat required for water heating calculated for each month	145.2877	127.0493	131.0827	114.2629	109.6205	94.5791	87.6415	100.5859	101.8034	118.6609	129.5482	140.7033 (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	145.2877	127.0493	131.0827	114.2629	109.6205	94.5791	87.6415	100.5859	101.8034	118.6609	129.5482	140.7033 (64)
Heat gains from water heating, kWh/month	48.2558	42.1997	43.5412	37.9557	36.4150	31.4196	29.1149	33.4138	33.8169	39.4151	43.0298	46.7331 (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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2179	17.0692	13.8816	10.5093	7.8558	6.6322	7.1663	9.3150	12.5026	15.8750	18.5284	19.7520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	64.8599	62.7972	58.5231	52.7162	48.9449	43.6384	39.1330	44.9110	46.9679	52.9772	59.7636	62.8133	(72)
Total internal gains	346.4022	344.2862	331.5443	311.1245	290.5105	270.6444	257.7639	263.5954	274.1200	294.7422	318.3713	335.9806	(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	
East					1.7900	19.6403	0.6300	0.7000	0.7700		10.7442 (76)	
South					2.6900	46.7521	0.6300	0.7000	0.7700		38.4348 (78)	
West					1.7900	19.6403	0.6300	0.7000	0.7700		10.7442 (80)	
West					4.0400	19.6403	0.6300	0.7000	0.7700		24.2494 (80)	

Solar gains	84.1725	152.4189	227.5311	305.5228	357.8024	360.4842	345.4695	306.7121	255.1326	174.0603	102.5879	70.8237 (83)
Total gains	430.5747	496.7051	559.0754	616.6473	648.3129	631.1287	603.2335	570.3075	529.2526	468.8026	420.9592	406.8043 (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	61.3523	61.5641	61.7732	62.7744	62.9654	63.8698	63.8698	64.0402	63.5184	62.9654	62.5803	62.1827	
alpha	5.0902	5.1043	5.1182	5.1850	5.1977	5.2580	5.2580	5.2693	5.2346	5.1977	5.1720	5.1455	
util living area	0.9980	0.9956	0.9881	0.9620	0.8880	0.7302	0.5577	0.6082	0.8503	0.9765	0.9959	0.9985	(86)
MIT	20.0326	20.1482	20.3364	20.5822	20.7871	20.9086	20.9404	20.9363	20.8561	20.5846	20.2662	20.0175	(87)
Th 2	19.9749	19.9780	19.9811	19.9957	19.9985	20.0112	20.0112	20.0136	20.0063	19.9985	19.9929	19.9872	(88)
util rest of house	0.9974	0.9940	0.9838	0.9476	0.8454	0.6416	0.4393	0.4885	0.7807	0.9649	0.9942	0.9981	(89)
MIT 2	18.6777	18.8487	19.1244	19.4865	19.7617	19.9085	19.9326	19.9330	19.8554	19.4971	19.0332	18.6652	(90)
Living area fraction	19.1717	19.3225	19.5663	19.8860	20.1355	20.2732	20.3000	20.2988	20.2202	19.8936	19.4827	19.1582	(91)
MIT	19.0217	19.1725	19.4163	19.7360	19.9855	20.1232	20.1500	20.1488	20.0702	19.7436	19.3327	19.0082	(92)
Temperature adjustment												-0.1500	
adjusted MIT													(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9924	0.9807	0.9429	0.8448	0.6525	0.4564	0.5057	0.7859	0.9609	0.9927	0.9974	(94)
Useful gains	429.0734	492.9295	548.2769	581.4443	547.6747	411.8095	275.3451	288.3850	415.9390	450.4904	417.8691	405.7365	(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	1199.7658	1159.1576	1045.4585	863.0896	657.9445	432.3762	277.9121	292.6892	469.9613	726.0777	977.3638	1190.7031	(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	573.3951	447.7053	369.9031	202.7846	82.0407	0.0000	0.0000	0.0000	0.0000	205.0370	402.8362	584.0151	(98)
Space heating												2867.7171	(98)
Space heating per m2												39.8294	(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													3179.2872 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	573.3951	447.7053	369.9031	202.7846	82.0407	0.0000	0.0000	0.0000	0.0000	205.0370	402.8362	584.0151	(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)	635.6930	496.3473	410.0921	224.8166	90.9542	0.0000	0.0000	0.0000	0.0000	227.3137	446.6033	647.4669	(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	145.2877	127.0493	131.0827	114.2629	109.6205	94.5791	87.6415	100.5859	101.8034	118.6609	129.5482	140.7033	(64)
Efficiency of water heater	87.0223	86.7368	86.1294	84.6871	81.7540	76.4000	76.4000	76.4000	76.4000	84.5984	86.4023	76.4000	(216)
Fuel for water heating, kWh/month	166.9544	146.4769	152.1927	134.9237	134.0859	123.7947	114.7140	131.6569	133.2505	140.2638	149.9360	161.4608	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													3179.2872 (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)													339.3942 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.80 * 951 * 0.80) =										-486.7154			-486.7154 (233)
Total delivered energy for all uses													4796.6762 (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	3179.2872	0.2160	686.7260 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1689.7102	0.2160	364.9774 (264)
Space and water heating			1051.7034 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	339.3942	0.5190	176.1456 (268)
Energy saving/generation technologies			
PV Unit	-486.7154	0.5190	-252.6053 (269)
Total CO2, kg/year			1014.1687 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0900 (273)

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

DER		14.0900 ZC1
Total Floor Area	TFA	72.0000
Assumed number of occupants	N	2.2937
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6185 ZC2
CO2 emissions from cooking, equation (L16)		2.4173 ZC3
Total CO2 emissions		33.1258 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		33.1258 ZC8

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SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0000 (1b)	x 2.7000 (2b)	= 194.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.4000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1543 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4043 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3740 (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	0.4768	0.4675	0.4581	0.4114	0.4020	0.3553	0.3553	0.3459	0.3740	0.4020	0.4207	0.4394 (22b)
	0.6137	0.6093	0.6049	0.5846	0.5808	0.5631	0.5631	0.5598	0.5699	0.5808	0.5885	0.5966 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			10.3100	1.3258	13.6686		(27)
Heat Loss Floor 1			3.1400	0.1300	0.4082		(28a)
External Wall 1	61.0200	10.3100	50.7100	0.1800	9.1278		(29a)
Total net area of external elements Aum(A, m ²)			64.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.2046		(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)							19.9475 (36)
Total fabric heat loss						(33) + (36) =	43.1521 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	39.3695	39.0863	38.8087	37.5048	37.2608	36.1251	36.1251
Heat transfer coeff	82.5216	82.2384	81.9607	80.6568	80.4129	79.2772	79.2772
Average = Sum(39)m / 12 =							
HLP	1.1461	1.1422	1.1383	1.1202	1.1168	1.1011	1.1011
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937 (42)
Average daily hot water use (litres/day)												88.6750 (43)
Daily hot water use	97.5425	93.9955	90.4485	86.9015	83.3545	79.8075	79.8075	83.3545	86.9015	90.4485	93.9955	97.5425 (44)
Energy conte	144.6527	126.5142	130.5513	113.8178	109.2109	94.2407	87.3279	100.2100	101.4068	118.1799	129.0026	140.0884 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	21.6979	18.9771	19.5827	17.0727	16.3816	14.1361	13.0992	15.0315	15.2110	17.7270	19.3504	21.0133 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	49.7066	43.2637	46.0916	42.8555	42.4765	39.3571	40.6690	42.4765	42.8555	46.0916	46.3539	49.7066 (61)
Total heat required for water heating calculated for each month												

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Solar input	194.3593	169.7779	176.6429	156.6733	151.6874	133.5978	127.9969	142.6865	144.2623	164.2714	175.3565	189.7950 (62)
	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	194.3593	169.7779	176.6429	156.6733	151.6874	133.5978	127.9969	142.6865	144.2623	164.2714	175.3565	189.7950 (64)
Heat gains from water heating, kWh/month	60.5237	52.8819	54.9312	48.5583	46.9318	41.1743	39.2038	43.9390	44.4316	50.8177	54.4818	59.0061 (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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2179	17.0692	13.8816	10.5093	7.8558	6.6322	7.1663	9.3150	12.5026	15.8750	18.5284	19.7520 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684 (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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474 (71)
Water heating gains (Table 5)	81.3490	78.6933	73.8323	67.4421	63.0803	57.1865	52.6932	59.0577	61.7106	68.3034	75.6692	79.3092 (72)
Total internal gains	362.8914	360.1822	346.8535	325.8504	304.6459	284.1926	271.3242	277.7421	288.8627	310.0684	334.2770	352.4765 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	1.7900	19.6403	0.6300		0.7000	0.7700	10.7442 (76)
South	2.6900	46.7521	0.6300		0.7000	0.7700	38.4348 (78)
West	5.8300	19.6403	0.6300		0.7000	0.7700	34.9935 (80)

Solar gains	84.1725	152.4189	227.5311	305.5228	357.8024	360.4842	345.4695	306.7121	255.1326	174.0603	102.5879	70.8237 (83)
Total gains	447.0639	512.6011	574.3846	631.3732	662.4483	644.6768	616.7937	584.4542	543.9953	484.1287	436.8649	423.3001 (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	60.5902	60.7989	61.0048	61.9910	62.1791	63.0698	63.0698	63.2376	62.7237	62.1791	61.7998	61.4082
alpha	5.0393	5.0533	5.0670	5.1327	5.1453	5.2047	5.2047	5.2158	5.1816	5.1453	5.1200	5.0939
util living area	0.9977	0.9949	0.9869	0.9594	0.8835	0.7247	0.5525	0.6014	0.8428	0.9738	0.9952	0.9982 (86)
MIT	19.7833	19.9367	20.1875	20.5145	20.7867	20.9472	20.9894	20.9839	20.8797	20.5212	20.0958	19.7626 (87)
Th 2	19.9633	19.9665	19.9696	19.9843	19.9871	20.0000	20.0000	20.0023	19.9950	19.9871	19.9815	19.9757 (88)
util rest of house	0.9969	0.9932	0.9822	0.9441	0.8397	0.6353	0.4337	0.4814	0.7713	0.9610	0.9932	0.9976 (89)
MIT 2	18.3442	18.5700	18.9361	19.4120	19.7755	19.9642	19.9960	19.9956	19.8981	19.4304	18.8138	18.3228 (90)
Living area fraction									fLA = Living area / (4) =			0.3646 (91)
MIT	18.8689	19.0683	19.3923	19.8140	20.1441	20.3226	20.3582	20.3559	20.2559	19.8281	19.2812	18.8477 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8689	19.0683	19.3923	19.8140	20.1441	20.3226	20.3582	20.3559	20.2559	19.8281	19.2812	18.8477 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9957	0.9911	0.9787	0.9410	0.8474	0.6660	0.4773	0.5254	0.7922	0.9584	0.9913	0.9967 (94)
Ext temp.	445.1385	508.0409	562.1370	594.0933	561.3829	429.3318	294.4097	307.0905	430.9281	463.9745	433.0633	421.9022 (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	1202.2494	1165.1753	1056.6644	880.2858	679.0179	453.6703	297.9384	312.7845	490.7188	742.0593	985.5368	1192.6502 (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	563.2905	441.5944	367.9284	206.0586	87.5204	0.0000	0.0000	0.0000	0.0000	206.8951	397.7809	573.4365 (98)
												2844.5048 (98)
												39.5070 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													3045.5083 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	563.2905	441.5944	367.9284	206.0586	87.5204	0.0000	0.0000	0.0000	0.0000	206.8951	397.7809	573.4365	(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)	603.0948	472.7991	393.9276	220.6195	93.7050	0.0000	0.0000	0.0000	0.0000	221.5151	425.8896	613.9577	(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	194.3593	169.7779	176.6429	156.6733	151.6874	133.5978	127.9969	142.6865	144.2623	164.2714	175.3565	189.7950	(64)
Efficiency of water heater	87.5743	87.3490	86.8564	85.7419	83.7224	80.3000	80.3000	80.3000	80.3000	85.6331	87.0501	87.6583	(216)
Fuel for water heating, kWh/month	221.9364	194.3672	203.3736	182.7267	181.1791	166.3734	159.3984	177.6918	179.6542	191.8318	201.4433	216.5170	(219)
Water heating fuel used												2276.4928	(219)
Annual totals kWh/year													
Space heating fuel - main system												3045.5083	(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)												339.3942	(232)
Total delivered energy for all uses												5736.3952	(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	3045.5083	0.2160	657.8298 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2276.4928	0.2160	491.7224 (264)
Space and water heating			1149.5522 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	339.3942	0.5190	176.1456 (268)
Total CO2, kg/m2/year			1364.6228 (272)
Emissions per m2 for space and water heating			15.9660 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4465 (272b)
Emissions per m2 for pumps and fans			0.5406 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9660 * 1.00) + 2.4465 + 0.5406, rounded to 2 d.p.			18.9500 (273)

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Property Reference	J02855 Flat 8			Issued on Date	17/09/2024
Assessment Reference	J02855 Flat 8	Prop Type Ref	As Built		
Property	Flat 8, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	92 A	DER	8.42	TER	17.22
Environmental	95 A	% DER<TER	51.10		
CO ₂ Emissions (t/year)	0.32	DFEE	34.76	TFEE	40.31
General Requirements Compliance	Pass	% DFEE<TFEE	13.77		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, stephen@energyreport.co.uk			Assessor ID	w557-0001
Client	Country Estates, Country Estates				

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

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

DWELLING AS BUILT

Top-floor flat, total floor area 69 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) 17.22 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.42 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)40.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.30 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 6.44 (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 835 VUW 356/6-3 (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: Time and temperature zone control 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 (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing East: 1.65 m², No overhang
Windows facing South: 1.78 m², No overhang
Windows facing West: 4.04 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Photovoltaic array 1.60 kW

FULL SAP CALCULATION PRINTOUT

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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	69.0000 (1b)	x 2.4000 (2b)	= 165.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.6000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	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) =	0.1208 (8)
Pressure test				Yes	
Measured/design AP50				6.4400	
Infiltration rate				0.4428	(18)
Number of sides sheltered				1	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4096 (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	0.5222	0.5120	0.5017	0.4505	0.4403	0.3891	0.3891	0.3788	0.4096	0.4403	0.4608	0.4812 (22b)
Effective ac	0.6363	0.6310	0.6259	0.6015	0.5969	0.5757	0.5757	0.5718	0.5839	0.5969	0.6062	0.6158 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1 (Uw = 1.30)			7.4700	1.2357	9.2310		(27)
External Wall 1	54.2400	7.4700	46.7700	0.1500	7.0155		(29a)
External Roof 1	38.8900		38.8900	0.1300	5.0557		(30)
External Roof 2	29.3300		29.3300	0.1300	3.8129		(30)
Total net area of external elements Aum(A, m ²)			122.4600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1151		(33)
Party Wall 1			52.5900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5580 (36)
Total fabric heat loss						(33) + (36) =	31.6731 (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	34.7749	34.4856	34.2020	32.8699	32.6207	31.4605	31.4605	31.2457	31.9074	32.6207	33.1249	33.6520 (38)
Heat transfer coeff	66.4480	66.1587	65.8751	64.5430	64.2938	63.1336	63.1336	62.9188	63.5805	64.2938	64.7980	65.3251 (39)
Average = Sum(39)m / 12 =												64.5418 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9630	0.9588	0.9547	0.9354	0.9318	0.9150	0.9150	0.9119	0.9215	0.9318	0.9391	0.9467 (40)
HLP (average)												0.9354 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2216 (42)
Average daily hot water use (litres/day)												86.9631 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	95.6594	92.1809	88.7024	85.2238	81.7453	78.2668	78.2668	81.7453	85.2238	88.7024	92.1809	95.6594 (44)
Energy conte	141.8601	124.0718	128.0310	111.6205	107.1025	92.4213	85.6420	98.2754	99.4491	115.8984	126.5121	137.3840 (45)
Energy content (annual)										Total = Sum(45)m =		1368.2681 (45)
Distribution loss (46)m = 0.15 x (45)m	21.2790	18.6108	19.2046	16.7431	16.0654	13.8632	12.8463	14.7413	14.9174	17.3848	18.9768	20.6076 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Combi loss	0.6107	0.5147	0.5110	0.4281	0.3940	0.3255	0.3016	0.3615	0.3814	0.4626	0.5248	0.5914 (61)
Total heat required for water heating calculated for each month	142.4708	124.5864	128.5420	112.0486	107.4965	92.7468	85.9436	98.6369	99.8305	116.3610	127.0369	137.9754 (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	142.4708	124.5864	128.5420	112.0486	107.4965	92.7468	85.9436	98.6369	99.8305	116.3610	127.0369	137.9754 (64)
Heat gains from water heating, kWh/month	47.3212	41.3825	42.6981	37.2208	35.7101	30.8115	28.5514	32.7669	33.1622	38.6519	42.1965	45.8280 (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	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7319	17.5257	14.2528	10.7903	8.0659	6.8096	7.3580	9.5642	12.8370	16.2995	19.0240	20.2803 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.9520	196.9749	191.8771	181.0243	167.3246	154.4489	145.8471	143.8241	148.9220	159.7747	173.4744	186.3502 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080 (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)	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642 (71)
Water heating gains (Table 5)	63.6037	61.5812	57.3899	51.6956	47.9974	42.7937	38.3755	44.0416	46.0586	51.9514	58.6062	61.5968 (72)
Total internal gains	337.6116	335.4058	322.8438	302.8343	282.7120	263.3762	250.9046	256.7539	267.1416	287.3497	310.4286	327.5513 (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

East	1.6500	19.6403	0.7600	0.7000	0.7700	11.9475 (76)
South	1.7800	46.7521	0.7600	0.7000	0.7700	30.6807 (78)
West	4.0400	19.6403	0.7600	0.7000	0.7700	29.2532 (80)

Solar gains	71.8814	130.8444	196.7382	265.9227	312.6255	315.4057	302.0942	267.4441	221.2348	149.8317	87.7395	60.3924 (83)
Total gains	409.4930	466.2502	519.5820	568.7569	595.3375	578.7819	552.9988	524.1981	488.3765	437.1814	398.1682	387.9437 (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	72.1115	72.4269	72.7387	74.2399	74.5277	75.8972	75.8972	76.1564	75.3638	74.5277	73.9478	73.3511
alpha	5.8074	5.8285	5.8492	5.9493	5.9685	6.0598	6.0598	6.0771	6.0243	5.9685	5.9299	5.8901
util living area	0.9981	0.9954	0.9868	0.9537	0.8584	0.6722	0.4984	0.5453	0.8078	0.9711	0.9956	0.9986 (86)
MIT	20.2124	20.3177	20.4852	20.7009	20.8620	20.9391	20.9528	20.9514	20.9078	20.6949	20.4188	20.2011 (87)
Th 2	20.1143	20.1178	20.1212	20.1375	20.1406	20.1548	20.1548	20.1574	20.1493	20.1406	20.1344	20.1280 (88)
util rest of house	0.9974	0.9939	0.9824	0.9377	0.8140	0.5941	0.4048	0.4490	0.7387	0.9580	0.9938	0.9981 (89)
MIT 2	19.0514	19.2077	19.4534	19.7718	19.9834	20.0784	20.0882	20.0903	20.0460	19.7708	19.3693	19.0460 (90)
Living area fraction	19.5095	19.6458	19.8606	20.1385	20.3301	20.4180	20.4294	20.4301	20.3861	20.1355	19.7834	19.5019 (92)
Temperature adjustment	19.3595	19.4958	19.7106	19.9885	20.1801	20.2680	20.2794	20.2801	20.2361	19.9855	19.6334	19.3519 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9967	0.9925	0.9797	0.9344	0.8163	0.6050	0.4188	0.4633	0.7465	0.9550	0.9925	0.9976 (94)
Useful gains	408.1406	462.7642	509.0230	531.4417	485.9515	350.1732	231.5888	242.8714	364.5738	417.5029	395.1838	386.9943 (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	1000.6771	965.6359	870.2474	715.6832	545.2202	357.8443	232.2931	244.1318	390.1355	603.4306	812.1420	989.7971 (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	440.8472	337.9298	268.7510	132.6538	44.0959	0.0000	0.0000	0.0000	0.0000	138.3302	300.2099	448.4853 (98)
Space heating												2111.3030 (98)
Space heating per m2												30.5986 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2340.6907 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	440.8472	337.9298	268.7510	132.6538	44.0959	0.0000	0.0000	0.0000	0.0000	138.3302	300.2099	448.4853	(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)	488.7441	374.6450	297.9501	147.0663	48.8868	0.0000	0.0000	0.0000	0.0000	153.3594	332.8269	497.2121	(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	142.4708	124.5864	128.5420	112.0486	107.4965	92.7468	85.9436	98.6369	99.8305	116.3610	127.0369	137.9754	(64)
Efficiency of water heater	86.3888	86.0149	85.2197	83.3095	79.9584	76.4000	76.4000	76.4000	76.4000	83.3238	85.6025	86.5231	(217)
Fuel for water heating, kWh/month	164.9182	144.8428	150.8361	134.4967	134.4405	121.3964	112.4916	129.1059	130.6682	139.6491	148.4033	159.4665	(219)
Water heating fuel used												1670.7153	(219)
Annual totals kWh/year													
Space heating fuel - main system												2340.6907	(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)													348.4711 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.60 * 951 * 0.80) =													-973.4308
Total delivered energy for all uses													3461.4463 (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	2340.6907	0.2160	505.5892 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1670.7153	0.2160	360.8745 (264)
Space and water heating			866.4637 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	348.4711	0.5190	180.8565 (268)
Energy saving/generation technologies			
PV Unit	-973.4308	0.5190	-505.2106 (269)
Total CO2, kg/year			581.0346 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			8.4200 (273)

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

DER			8.4200 ZC1
Total Floor Area		TFA	69.0000
Assumed number of occupants		N	2.2216
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.7427 ZC2
CO2 emissions from cooking, equation (L16)			2.4974 ZC3
Total CO2 emissions			27.6600 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			27.6600 ZC8

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SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.0000 (1b)	x 2.4000 (2b)	= 165.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.6000 (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 20.0000 / (5) = 0.1208 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3708 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3430 (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												
	0.4373	0.4287	0.4201	0.3773	0.3687	0.3258	0.3258	0.3172	0.3430	0.3687	0.3858	0.4030 (22b)
Effective ac	0.5956	0.5919	0.5883	0.5712	0.5680	0.5531	0.5531	0.5503	0.5588	0.5680	0.5744	0.5812 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.40)			7.4700	1.3258	9.9034		(27)					
External Wall 1	54.2400	7.4700	46.7700	0.1800	8.4186		(29a)					
External Roof 1	38.8900		38.8900	0.1300	5.0557		(30)					
External Roof 2	29.3300		29.3300	0.1300	3.8129		(30)					
Total net area of external elements Aum(A, m2)			122.4600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.1906		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3112 (36)					
Total fabric heat loss						(33) + (36) =	32.5018 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 32.5487	Feb 32.3459	Mar 32.1470	Apr 31.2129	May 31.0382	Jun 30.2246	Jul 30.2246	Aug 30.0740	Sep 30.5380	Oct 31.0382	Nov 31.3917	Dec 31.7613 (38)
Heat transfer coeff	65.0505	64.8477	64.6488	63.7147	63.5400	62.7264	62.7264	62.5758	63.0398	63.5400	63.8935	64.2631 (39)
Average = Sum(39)m / 12 =												63.7139 (39)
HLP	Jan 0.9428	Feb 0.9398	Mar 0.9369	Apr 0.9234	May 0.9209	Jun 0.9091	Jul 0.9091	Aug 0.9069	Sep 0.9136	Oct 0.9209	Nov 0.9260	Dec 0.9313 (40)
HLP (average)												0.9234 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2216 (42)
Average daily hot water use (litres/day)												86.9631 (43)
Daily hot water use	95.6594	92.1809	88.7024	85.2238	81.7453	78.2668	78.2668	81.7453	85.2238	88.7024	92.1809	95.6594 (44)
Energy conte	141.8601	124.0718	128.0310	111.6205	107.1025	92.4213	85.6420	98.2754	99.4491	115.8984	126.5121	137.3840 (45)
Energy content (annual)										Total = Sum(45)m =		1368.2681 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.2790	18.6108	19.2046	16.7431	16.0654	13.8632	12.8463	14.7413	14.9174	17.3848	18.9768	20.6076 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	48.7470	42.4285	45.2017	42.0282	41.6565	38.5973	39.8839	41.6565	42.0282	45.2017	45.4591	48.7470 (61)

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Total heat required for water heating calculated for each month												
	190.6071	166.5002	173.2327	153.6487	148.7590	131.0187	125.5258	139.9319	141.4773	161.1001	171.9712	186.1309 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
	190.6071	166.5002	173.2327	153.6487	148.7590	131.0187	125.5258	139.9319	141.4773	161.1001	171.9712	186.1309 (64)
Total per year (kWh/year) = Sum (64)m =												1889.9037 (64)
Heat gains from water heating, kWh/month												
	59.3552	51.8610	53.8707	47.6209	46.0257	40.3794	38.4469	43.0907	43.5739	49.8366	53.4300	57.8669 (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	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802	111.0802 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	19.7319	17.5257	14.2528	10.7903	8.0659	6.8096	7.3580	9.5642	12.8370	16.2995	19.0240	20.2803 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	194.9520	196.9749	191.8771	181.0243	167.3246	154.4489	145.8471	143.8241	148.9220	159.7747	173.4744	186.3502 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080	34.1080 (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)												
	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642 (71)
Water heating gains (Table 5)												
	79.7785	77.1741	72.4069	66.1401	61.8625	56.0825	51.6760	57.9176	60.5193	66.9847	74.2084	77.7781 (72)
Total internal gains	353.7864	350.9988	337.8609	317.2788	296.5771	276.6650	264.2051	270.6299	281.6023	302.3831	326.0308	343.7326 (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
East				1.6500	19.6403	0.6300	0.7000			0.7700			9.9038 (76)
South				1.7800	46.7521	0.6300	0.7000			0.7700			25.4327 (78)
West				4.0400	19.6403	0.6300	0.7000			0.7700			24.2494 (80)
Solar gains	59.5859	108.4631	163.0856	220.4359	259.1501	261.4548	250.4202	221.6971	183.3920	124.2026	72.7315	50.0621	(83)
Total gains	413.3723	459.4619	500.9465	537.7147	555.7272	538.1198	514.6253	492.3270	464.9943	426.5857	398.7623	393.7947	(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	73.6607	73.8911	74.1184	75.2050	75.4118	76.3899	76.3899	76.5738	76.0102	75.4118	74.9946	74.5632
alpha	5.9107	5.9261	5.9412	6.0137	6.0275	6.0927	6.0927	6.1049	6.0673	6.0275	5.9996	5.9709
util living area	0.9979	0.9957	0.9886	0.9623	0.8826	0.7097	0.5307	0.5753	0.8283	0.9734	0.9955	0.9985 (86)
MIT	20.0469	20.1698	20.3739	20.6401	20.8574	20.9722	20.9959	20.9934	20.9291	20.6512	20.3030	20.0269 (87)
Th 2	20.1313	20.1338	20.1362	20.1477	20.1498	20.1598	20.1598	20.1616	20.1559	20.1498	20.1455	20.1409 (88)
util rest of house	0.9973	0.9942	0.9847	0.9488	0.8425	0.6311	0.4324	0.4753	0.7619	0.9612	0.9937	0.9980 (89)
MIT 2	18.8518	19.0330	19.3309	19.7183	20.0069	20.1407	20.1582	20.1588	20.0987	19.7405	19.2367	18.8300 (90)
Living area fraction	19.3234	19.4816	19.7425	20.0821	20.3425	20.4688	20.4887	20.4882	20.4264	20.0999	19.6575	0.3946 (91)
MIT	19.3234	19.4816	19.7425	20.0821	20.3425	20.4688	20.4887	20.4882	20.4264	20.0999	19.6575	19.3023 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3234	19.4816	19.7425	20.0821	20.3425	20.4688	20.4887	20.4882	20.4264	20.0999	19.6575	19.3023 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9928	0.9824	0.9476	0.8525	0.6612	0.4713	0.5150	0.7850	0.9604	0.9924	0.9973 (94)
Useful gains	411.8934	456.1604	492.1239	509.5156	473.7801	355.7867	242.5625	253.5404	365.0435	409.6721	395.7159	392.7207 (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	977.2831	945.5833	856.1103	712.4655	549.1452	368.1304	243.9272	255.8205	398.8174	603.6232	802.3430	970.5231 (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	420.6500	328.8921	270.8059	146.1239	56.0717	0.0000	0.0000	0.0000	0.0000	144.2996	292.7715	429.8850 (98)
Space heating												2089.4997 (98)
Space heating per m2										(98) / (4) =		30.2826 (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												2237.1517	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	420.6500	328.8921	270.8059	146.1239	56.0717	0.0000	0.0000	0.0000	0.0000	144.2996	292.7715	429.8850	(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)	450.3747	352.1329	289.9420	156.4496	60.0339	0.0000	0.0000	0.0000	0.0000	154.4964	313.4598	460.2623	(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	190.6071	166.5002	173.2327	153.6487	148.7590	131.0187	125.5258	139.9319	141.4773	161.1001	171.9712	186.1309	(64)
Efficiency of water heater	86.9882	86.7334	86.1716	84.9251	82.8334	80.3000	80.3000	80.3000	80.3000	84.7753	86.3797	87.0902	(216)
(217)m	86.9882	86.7334	86.1716	84.9251	82.8334	80.3000	80.3000	80.3000	80.3000	84.7753	86.3797	87.0902	(217)
Fuel for water heating, kWh/month	219.1183	191.9677	201.0323	180.9227	179.5882	163.1615	156.3211	174.2614	176.1859	190.0320	199.0875	213.7220	(219)
Water heating fuel used												2245.4007	(219)
Annual totals kWh/year													
Space heating fuel - main system												2237.1517	(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)												348.4711	(232)
Total delivered energy for all uses												4906.0234	(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	2237.1517	0.2160	483.2248 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2245.4007	0.2160	485.0065 (264)
Space and water heating			968.2313 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	348.4711	0.5190	180.8565 (268)
Total CO2, kg/m2/year			1188.0128 (272)
Emissions per m2 for space and water heating			14.0323 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6211 (272b)
Emissions per m2 for pumps and fans			0.5641 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0323 * 1.00) + 2.6211 + 0.5641, rounded to 2 d.p.			17.2200 (273)