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Energy Statement for planning

Flats 1-10, 18 Parkside Road, Reading
Country Estates Ltd
J03207
23rd October 2024
Issue:3

Registry of Amendments

Revision	Date	Amendment Details	Prepared by
1	18/09/24	Initial issue	T Pope
2	24/09/24	Update to full SAP calculations and report format	T Pope
3	23/10/24	Updated report with reconfigured Solar PV	T Pope

About Energy Report Limited

A specialist building energy and sustainability consultancy offering expertise and experience to our clients within the construction and building sectors. Offering a full inclusive service from design to completion for any energy efficiency or sustainability issue.

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1.0 EXECUTIVE SUMMARY

This Energy Statement has been prepared by Energy Report Ltd on behalf of Country Estates Ltd in support of a full planning application for the proposed 10 residential flats with associated landscaping and parking at 18 Parkside Road, Reading – Reading Borough Council ('RBC'). The report identifies a **minimum of 35%** of energy demand from decentralised and renewable or low carbon energy sources for each dwelling.

The report has been developed to address the energy performance policy requirements of the EHDC Planning permission condition.

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.

2.0 DEVELOPMENT DESCRIPTION

Application for full planning permission for development of the site to provide 10 new flats

3.0 CALCULATION METHOD

SAP replicates a version of the building, which is the same size, shape and fitted with the same services but has a standard set of performance criteria applied.

The proposed houses have been assessed using approved software (SAP 2012). Please refer to Appendix 1 for a full schedule of the calculation results.

A fabric first approach has been taken, aiming to achieve very high efficiency standards thus reducing the requirement for energy.

The following efficiency improvements have been incorporated into the scheme:

- Thermal performance: improved U-values as detailed in the table below.
- Low leakage/infiltration: design air permeability levels of 5.0 m³/h/m²@50pa

Thermal properties.

Building Element	Proposed Development (W/m² K)	Part L limits (W/m² K)
Walls	0.15	0.26
Ground Floor	0.13	0.18
Roof	0.13	0.16
Window	1.3	1.6
Door	1.0	1.6
Air Permeability	5.0	8.0
Solar PV	0.86-1.72 kWh per dwelling	

4.0 PREDICTED ENERGY USAGE CALCULATIONS

The following table sets out the predicated energy calculation reduction under for the development In accordance with the requirements of the EHDC guidelines, these are reported as below using SAP 10 factors.

% of predicted energy usage calculations

	DER	TER	Floor Area (m2)	% reduction
Flat 1	11.93	20.89	68	42.90
Flat 2	10.97	18.02	82	39.14
Flat 3	11.91	20.06	63	40.64
Flat 4	11.94	18.95	72	37.00
Flat 5	11.75	19.51	65	39.79
Flat 6	13.62	21.02	70	35.21
Flat 7	13.18	20.47	53	35.61
Flat 8	9.84	17.22	69	42.85
Flat 9	9.54	17.66	65	45.99
Flat 10	10.52	18.89	71	44.30
Overall reduction in CO2 for the whole development				40.34%

Table 3 – Overall CO2 reductions

CONCLUSION

The Energy Statement outlines how the proposed development Parkside Road will meet the planning energy requirements as specified by the Reading Borough Council by providing a minimum of 35% reduction in CO2 compared to Part L 2013 for each dwelling.

Disclaimer

Energy Report Ltd disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report.

Energy Report Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such parties rely upon the report at their own risk.

Appendix 1- SAP Summaries

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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Property Reference	J02855 Flat 1			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 1	Prop Type Ref	As Built		
Property	Flat 1, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	90 B	DER	11.93	TER	20.89
Environmental	92 A	% DER<TER	42.90		
CO ₂ Emissions (t/year)	0.51	DFEE	49.73	TFEE	56.42
General Requirements Compliance	Pass	% DFEE<TFEE	11.87		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	w557-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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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

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) 11.93 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	1.23 (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: 4.43 (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 1.72 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 * 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) = 0.1089 (8)
Measured/design AP50					Yes
Infiltration rate					4.4300
Number of sides sheltered					0.3304 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3057 (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												
	0.3897	0.3821	0.3744	0.3362	0.3286	0.2904	0.2904	0.2827	0.3057	0.3286	0.3439	0.3591 (22b)
Effective ac	0.5759	0.5730	0.5701	0.5565	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5591	0.5645 (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)			3.4200	1.2357	4.2262		(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) =	31.1577		(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) =	41.8404 (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	34.8947	34.7161	34.5410	33.7185	33.5646	32.8482	32.8482	32.7155	33.1241	33.5646	33.8759	34.2013 (38)
Heat transfer coeff	76.7352	76.5565	76.3814	75.5589	75.4050	74.6886	74.6886	74.5560	74.9646	75.4050	75.7163	76.0418 (39)
Average = Sum(39)m / 12 =												75.5581 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1285	1.1258	1.1233	1.1112	1.1089	1.0984	1.0984	1.0964	1.1024	1.1089	1.1135	1.1183 (40)
HLP (average)												1.1111 (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
	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)

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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	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	61.5392	61.6828	61.8243	62.4972	62.6248	63.2255	63.2255	63.3380	62.9927	62.6248	62.3673	62.1004
alpha	5.1026	5.1122	5.1216	5.1665	5.1750	5.2150	5.2150	5.2225	5.1995	5.1750	5.1578	5.1400
util living area	0.9988	0.9981	0.9963	0.9908	0.9721	0.9064	0.7749	0.8072	0.9484	0.9913	0.9978	0.9990 (86)
MIT	19.9968	20.0703	20.2143	20.4214	20.6357	20.8239	20.9108	20.9008	20.7640	20.4921	20.2121	19.9843 (87)
Th 2	19.9777	19.9798	19.9819	19.9917	19.9936	20.0022	20.0022	20.0038	19.9989	19.9936	19.9898	19.9859 (88)
util rest of house												
	0.9983	0.9974	0.9949	0.9866	0.9566	0.8464	0.6415	0.6844	0.9115	0.9865	0.9968	0.9987 (89)
MIT 2	18.6275	18.7368	18.9488	19.2581	19.5662	19.8219	19.9084	19.9028	19.7478	19.3631	18.9522	18.6157 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.1865	19.2812	19.4654	19.7330	20.0028	20.2309	20.3176	20.3102	20.1626	19.8240	19.4665	19.1744 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0365	19.1312	19.3154	19.5830	19.8528	20.0809	20.1676	20.1602	20.0126	19.6740	19.3165	19.0244 (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	0.8522	0.6667	0.7068	0.9121	0.9844	0.9960	0.9982 (94)
Useful gains	367.5596	389.4674	402.5182	407.3529	394.8802	337.8743	252.1701	260.7543	328.3485	345.3967	346.7359	352.9815 (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												
	1130.8084	1089.4890	978.8588	807.1970	614.7631	409.3627	266.4592	280.3461	443.2380	684.2259	924.9910	1127.2741 (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												
	567.8571	470.4146	428.7974	287.8877	163.5929	0.0000	0.0000	0.0000	0.0000	252.0890	416.3437	576.0737 (98)
Space heating												3163.0560 (98)
Space heating per m2												46.5155 (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													3506.7140 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	567.8571	470.4146	428.7974	287.8877	163.5929	0.0000	0.0000	0.0000	0.0000	252.0890	416.3437	576.0737	(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)	629.5533	521.5239	475.3852	319.1660	181.3668	0.0000	0.0000	0.0000	0.0000	279.4778	461.5784	638.6626	(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	87.0631	86.9300	86.6109	85.8757	84.1945	76.4000	76.4000	76.4000	76.4000	85.3539	86.5637	87.1742	(217)
Fuel for water heating, kWh/month	162.5189	142.3357	147.3960	129.5835	126.8016	120.5647	111.7210	128.2213	129.7728	135.3933	145.7494	157.1903	(219)
Water heating fuel used												1637.2483	(219)
Annual totals kWh/year													
Space heating fuel - main system												3506.7140	(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 * 1.72 * 951 * 0.80) =										-1046.4381		-1046.4381	(233)
Total delivered energy for all uses												4566.3761	(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	3506.7140	0.2160	757.4502	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1637.2483	0.2160	353.6456	(264)
Space and water heating			1111.0959	(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	-1046.4381	0.5190	-543.1014	(269)
Total CO2, kg/year			811.3286	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9300	(273)

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

DER			11.9300	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			31.2379	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			31.2379	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	62.7478	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) =			0.4082 (91)
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 (92)
Temperature adjustment												0.0000
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	1.0000	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												44.5075 (99)
										(98) / (4) =		

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 2			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 2	Prop Type Ref	As Built		
Property	Flat 2, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	90 B	DER	10.97	TER	18.02
Environmental	92 A	% DER<TER	39.14		
CO ₂ Emissions (t/year)	0.60	DFEE	37.18	TFEE	46.43
General Requirements Compliance	Pass	% DFEE<TFEE	19.94		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	f764-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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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

Ground-floor flat, total floor area 82 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) 18.02 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.97 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.2 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	1.25 (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: 4.55 (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: 1.62 m², No overhang
Windows facing South: 1.81 m², No overhang
Windows facing West: 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 1.29 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	82.0000 (1b)	x 2.4000 (2b)	= 196.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.8000 (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 20.0000 / (5) = 0.1016 (8)
Pressure test					Yes
Measured/design AP50					4.5500
Infiltration rate					0.3291 (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) =	0.3044 (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	0.3882	0.3806	0.3729	0.3349	0.3273	0.2892	0.2892	0.2816	0.3044	0.3273	0.3425	0.3577 (22b)
Effective ac	0.5753	0.5724	0.5695	0.5561	0.5536	0.5418	0.5418	0.5397	0.5463	0.5536	0.5587	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1 (Uw = 1.30)			4.3300	1.2357	5.3508		(27)
Door			4.0300	1.2000	4.8360		(26)
Heat Loss Floor 1			82.0000	0.1300	10.6600		(28a)
External Wall 1	60.5800	8.3600	52.2200	0.1500	7.8330		(29a)
Total net area of external elements Aum(A, m ²)			142.5800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6798		(33)
Party Wall 1			10.7700	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)							8.7426 (36)
Total fabric heat loss						(33) + (36) =	37.4223 (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	37.3646	37.1746	36.9884	36.1137	35.9500	35.1882	35.1882	35.0471	35.4817	35.9500	36.2811	36.6272 (38)
Heat transfer coeff	74.7869	74.5969	74.4107	73.5360	73.3724	72.6106	72.6106	72.4695	72.9040	73.3724	73.7034	74.0495 (39)
Average = Sum(39)m / 12 =												73.5352 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9120	0.9097	0.9074	0.8968	0.8948	0.8855	0.8855	0.8838	0.8891	0.8948	0.8988	0.9030 (40)
HLP (average)												0.8968 (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												2.4997 (42)
Average daily hot water use (litres/day)												93.5682 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.9250	99.1823	95.4396	91.6969	87.9541	84.2114	84.2114	87.9541	91.6969	95.4396	99.1823	102.9250 (44)
Energy content (annual)	152.6349	133.4954	137.7553	120.0984	115.2373	99.4410	92.1467	105.7397	107.0026	124.7012	136.1211	147.8187 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1472.1924 (45)
Water storage loss:	22.8952	20.0243	20.6633	18.0148	17.2856	14.9162	13.8220	15.8610	16.0504	18.7052	20.4182	22.1728 (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)

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Combi loss	0.6702	0.5958	0.5916	0.4956	0.4561	0.3768	0.3492	0.4185	0.4415	0.5356	0.6075	0.6491 (61)
Total heat required for water heating calculated for each month	153.3051	134.0912	138.3469	120.5940	115.6934	99.8179	92.4959	106.1582	107.4441	125.2368	136.7286	148.4678 (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	153.3051	134.0912	138.3469	120.5940	115.6934	99.8179	92.4959	106.1582	107.4441	125.2368	136.7286	148.4678 (64)
Heat gains from water heating, kWh/month	50.9186	44.5362	45.9516	40.0566	38.4304	33.1584	30.7261	35.2631	35.6887	41.5970	45.4122	49.3120 (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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7219	22.8460	19.5796	14.0660	10.5145	8.8768	9.5917	12.4676	16.7340	21.2476	24.7991	26.4368 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986 (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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)	68.4390	66.2741	61.7628	55.6342	51.6538	46.0533	41.2985	47.3966	49.5677	55.9100	63.0724	66.2796 (72)
Total internal gains	381.2263	378.5054	363.8816	340.7934	317.5508	295.5467	281.6424	288.2965	300.5801	323.8820	350.3066	369.9173 (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	1.6200	19.6403	0.7600		0.7000	0.7700	11.7302 (76)
South	1.8100	46.7521	0.7600		0.7000	0.7700	31.1978 (78)
West	0.9000	19.6403	0.7600		0.7000	0.7700	6.5168 (80)

Solar gains	49.4449	86.7891	123.8694	159.2939	181.7242	181.3271	174.4765	157.9564	136.3577	97.4649	59.7320	41.9633 (83)
Total gains	430.6712	465.2945	487.7510	500.0873	499.2750	476.8738	456.1189	446.2528	436.9379	421.3469	410.0386	411.8805 (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	76.1423	76.3362	76.5272	77.4375	77.6102	78.4245	78.4245	78.5771	78.1088	77.6102	77.2616	76.9005
alpha	6.0762	6.0891	6.1018	6.1625	6.1740	6.2283	6.2283	6.2385	6.2073	6.1740	6.1508	6.1267
util living area	0.9990	0.9981	0.9957	0.9872	0.9564	0.8503	0.6757	0.7122	0.9141	0.9884	0.9978	0.9992 (86)
MIT	20.2201	20.2936	20.4222	20.5992	20.7714	20.9029	20.9461	20.9423	20.8627	20.6437	20.4019	20.2068 (87)
Th 2	20.1573	20.1592	20.1612	20.1702	20.1719	20.1798	20.1798	20.1813	20.1768	20.1719	20.1685	20.1649 (88)
util rest of house	0.9986	0.9974	0.9941	0.9819	0.9358	0.7827	0.5624	0.6024	0.8671	0.9825	0.9970	0.9990 (89)
MIT 2	19.0977	19.2068	19.3961	19.6601	19.9037	20.0737	20.1113	20.1106	20.0279	19.7269	19.3728	19.0845 (90)
Living area fraction	19.4028	19.5022	19.6750	19.9154	20.1396	20.2991	20.3383	20.3367	20.2548	19.9761	19.6525	19.3896 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2528	19.3522	19.5250	19.7654	19.9896	20.1491	20.1883	20.1867	20.1048	19.8261	19.5025	19.2396 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	429.8668	463.7043	484.0527	489.2881	464.3647	371.8569	257.0693	269.1738	376.6724	412.5353	408.4010	411.2945 (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	1118.2747	1078.0919	969.1989	798.9965	608.2246	402.9222	260.5453	274.4173	437.7743	676.9432	914.1090	1113.6765 (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	512.1754	412.8684	360.9488	222.9901	107.0317	0.0000	0.0000	0.0000	0.0000	196.7195	364.1097	522.5722 (98)
Space heating												2699.4159 (98)
Space heating per m2												32.9197 (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													2992.7005 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	512.1754	412.8684	360.9488	222.9901	107.0317	0.0000	0.0000	0.0000	0.0000	196.7195	364.1097	522.5722	(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)	567.8220	457.7255	400.1650	247.2174	118.6605	0.0000	0.0000	0.0000	0.0000	218.0925	403.6693	579.3483	(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	153.3051	134.0912	138.3469	120.5940	115.6934	99.8179	92.4959	106.1582	107.4441	125.2368	136.7286	148.4678	(64)
Efficiency of water heater	86.5966	86.3751	85.9007	84.8224	82.4628	76.4000	76.4000	76.4000	76.4000	84.2784	85.9611	86.7338	(216)
Fuel for water heating, kWh/month	177.0335	155.2429	161.0544	142.1724	140.2977	130.6517	121.0680	138.9506	140.6337	148.5988	159.0587	171.1765	(219)
Water heating fuel used												1785.9387	(219)
Annual totals kWh/year													
Space heating fuel - main system													2992.7005 (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)													454.2574 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.29 * 951 * 0.80) =										-784.8286			-784.8286 (233)
Total delivered energy for all uses													4523.0681 (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	2992.7005	0.2160	646.4233 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1785.9387	0.2160	385.7628 (264)
Space and water heating			1032.1861 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	454.2574	0.5190	235.7596 (268)
Energy saving/generation technologies			
PV Unit	-784.8286	0.5190	-407.3260 (269)
Total CO2, kg/year			899.5446 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.9700 (273)

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

DER			10.9700 ZC1
Total Floor Area		TFA	82.0000
Assumed number of occupants		N	2.4997
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.1564 ZC2
CO2 emissions from cooking, equation (L16)			2.1828 ZC3
Total CO2 emissions			29.3093 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			29.3093 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	82.0000 (1b)	x 2.4000 (2b)	= 196.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.8000 (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					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) =				30.0000 / (5) =	0.1524 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4024 (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) =		0.3723 (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	0.4746	0.4653	0.4560	0.4095	0.4002	0.3536	0.3536	0.3443	0.3723	0.4002	0.4188	0.4374 (22b)
Effective ac	0.6126	0.6083	0.6040	0.5838	0.5801	0.5625	0.5625	0.5593	0.5693	0.5801	0.5877	0.5957 (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			4.0300	1.0000	4.0300			(26)					
TER Opening Type (Uw = 1.40)			4.3300	1.3258	5.7405			(27)					
Heat Loss Floor 1			82.0000	0.1300	10.6600			(28a)					
External Wall 1	60.5800	8.3600	52.2200	0.1800	9.3996			(29a)					
Total net area of external elements Aum(A, m2)			142.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			29.8301		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.0139 (36)					
Total fabric heat loss						(33) + (36) =		39.8440 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 39.7870	Feb 39.5029	Mar 39.2245	Apr 37.9168	May 37.6721	Jun 36.5331	Jul 36.5331	Aug 36.3221	Sep 36.9718	Oct 37.6721	Nov 38.1671	Dec 38.6845	(38)
Heat transfer coeff	79.6310	79.3470	79.0685	77.7608	77.5161	76.3771	76.3771	76.1662	76.8158	77.5161	78.0111	78.5286	(39)
Average = Sum(39)m / 12 =												77.7596	(39)
HLP	Jan 0.9711	Feb 0.9676	Mar 0.9643	Apr 0.9483	May 0.9453	Jun 0.9314	Jul 0.9314	Aug 0.9289	Sep 0.9368	Oct 0.9453	Nov 0.9514	Dec 0.9577	(40)
HLP (average)												0.9483	(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												2.4997 (42)
Average daily hot water use (litres/day)												93.5682 (43)
Daily hot water use	102.9250	99.1823	95.4396	91.6969	87.9541	84.2114	84.2114	87.9541	91.6969	95.4396	99.1823	102.9250 (44)
Energy conte	152.6349	133.4954	137.7553	120.0984	115.2373	99.4410	92.1467	105.7397	107.0026	124.7012	136.1211	147.8187 (45)
Energy content (annual)										Total = Sum(45)m =		1472.1924 (45)
Distribution loss (46)m = 0.15 x (45)m	22.8952	20.0243	20.6633	18.0148	17.2856	14.9162	13.8220	15.8610	16.0504	18.7052	20.4182	22.1728 (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	50.9589	45.6510	48.6350	45.2204	44.8205	41.5289	42.9132	44.8205	45.2204	48.6350	48.9118	50.9589 (61)

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Total heat required for water heating calculated for each month												
	203.5938	179.1465	186.3903	165.3188	160.0578	140.9699	135.0599	150.5602	152.2230	173.3362	185.0329	198.7776 (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												
	203.5938	179.1465	186.3903	165.3188	160.0578	140.9699	135.0599	150.5602	152.2230	173.3362	185.0329	198.7776 (64)
Total per year (kWh/year) = Sum (64)m =												2030.4668 (64)
Heat gains from water heating, kWh/month												
	63.4908	55.8000	57.9624	51.2378	49.5215	43.4464	41.3671	46.3636	46.8835	53.6219	57.4882	61.8894 (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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	25.7219	22.8460	18.5796	14.0660	10.5145	8.8768	9.5917	12.4676	16.7340	21.2476	24.7991	26.4368 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986 (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)												
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)												
	85.3371	83.0357	77.9064	71.1636	66.5612	60.3422	55.6009	62.3166	65.1159	72.0724	79.8448	83.1847 (72)
Total internal gains	398.1244	395.2670	380.0252	356.3228	332.4582	309.8356	295.9448	303.2165	316.1284	340.0444	367.0789	386.8225 (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				1.6200	19.6403	0.6300	0.7000	0.7700	9.7238 (76)			
South				1.8100	46.7521	0.6300	0.7000	0.7700	25.8614 (78)			
West				0.9000	19.6403	0.6300	0.7000	0.7700	5.4021 (80)			
Solar gains	40.9872	71.9436	102.6812	132.0462	150.6398	150.3106	144.6318	130.9375	113.0334	80.7933	49.5147	34.7853 (83)
Total gains	439.1116	467.2106	482.7064	488.3691	483.0980	460.1463	440.5766	434.1540	429.1617	420.8377	416.5936	421.6078 (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	71.5104	71.7664	72.0191	73.2303	73.4614	74.5570	74.5570	74.7634	74.1311	73.4614	72.9953	72.5143
alpha	5.7674	5.7844	5.8013	5.8820	5.8974	5.9705	5.9705	5.9842	5.9421	5.8974	5.8664	5.8343
util living area	0.9989	0.9981	0.9962	0.9897	0.9668	0.8811	0.7204	0.7514	0.9294	0.9895	0.9977	0.9991 (86)
MIT	19.9449	20.0391	20.2109	20.4560	20.6980	20.9005	20.9778	20.9712	20.8437	20.5363	20.2054	19.9341 (87)
Th 2	20.1075	20.1104	20.1132	20.1266	20.1292	20.1409	20.1409	20.1430	20.1364	20.1292	20.1241	20.1188 (88)
util rest of house	0.9985	0.9975	0.9947	0.9853	0.9498	0.8183	0.6005	0.6374	0.8869	0.9841	0.9968	0.9988 (89)
MIT 2	18.6851	18.8249	19.0781	19.4443	19.7902	20.0594	20.1306	20.1285	19.9914	19.5637	19.0785	18.6777 (90)
Living area fraction	19.0275	19.1549	19.3860	19.7193	20.0370	20.2880	20.3609	20.3575	20.2231	19.8281	19.3848	19.0192 (92)
MIT	19.0275	19.1549	19.3860	19.7193	20.0370	20.2880	20.3609	20.3575	20.2231	19.8281	19.3848	19.0192 (93)
Temperature adjustment												0.0000
adjusted MIT	19.0275	19.1549	19.3860	19.7193	20.0370	20.2880	20.3609	20.3575	20.2231	19.8281	19.3848	19.0192 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9978	0.9965	0.9931	0.9825	0.9476	0.8308	0.6334	0.6684	0.8921	0.9815	0.9957	0.9983 (94)
Useful gains	438.1592	465.5584	479.3536	479.8084	457.7651	382.2829	279.0553	290.1684	382.8443	413.0518	414.8116	420.8878 (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	1172.7678	1131.0854	1018.8775	841.3175	646.2484	434.4359	287.2465	301.4306	470.3475	715.3252	958.3517	1163.7333 (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	546.5488	447.2342	401.4058	260.2865	140.2316	0.0000	0.0000	0.0000	0.0000	224.8914	391.3488	552.6771 (98)
Space heating												2964.6241 (98)
Space heating per m2										(98) / (4) =		36.1540 (99)

8c. Space cooling requirement

Not applicable

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

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													3174.1157 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	546.5488	447.2342	401.4058	260.2865	140.2316	0.0000	0.0000	0.0000	0.0000	224.8914	391.3488	552.6771	(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)	585.1700	478.8374	429.7706	278.6793	150.1409	0.0000	0.0000	0.0000	0.0000	240.7831	419.0030	591.7313	(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	203.5938	179.1465	186.3903	165.3188	160.0578	140.9699	135.0599	150.5602	152.2230	173.3362	185.0329	198.7776	(64)
Efficiency of water heater	87.4159	87.2610	86.9327	86.1891	84.7202	80.3000	80.3000	80.3000	80.3000	85.7077	86.8915	87.4891	(216)
Fuel for water heating, kWh/month	232.9025	205.2996	214.4075	191.8094	188.9250	175.5541	168.1942	187.4971	189.5678	202.2410	212.9471	227.2027	(219)
Water heating fuel used													2396.5480 (219)
Annual totals kWh/year													
Space heating fuel - main system													3174.1157 (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)													454.2574 (232)
Total delivered energy for all uses													6099.9212 (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	3174.1157	0.2160	685.6090 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2396.5480	0.2160	517.6544 (264)
Space and water heating			1203.2634 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	454.2574	0.5190	235.7596 (268)
Total CO2, kg/m2/year			1477.9480 (272)
Emissions per m2 for space and water heating			14.6739 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.8751 (272b)
Emissions per m2 for pumps and fans			0.4747 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6739 * 1.00) + 2.8751 + 0.4747, rounded to 2 d.p.			18.0200 (273)

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Property Reference	J02855 Flat 3			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 3	Prop Type Ref	As Built		
Property	Flat 3, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	89 B	DER	11.91	TER	20.06
Environmental	93 A	% DER<TER	40.64		
CO ₂ Emissions (t/year)	0.49	DFEE	42.45	TFEE	52.56
General Requirements Compliance	Pass	% DFEE<TFEE	19.22		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	f764-0001
Client					

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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 63 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) 20.06 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.91 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.5 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	(no roof)		
Openings	1.27 (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: 4.24 (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 North: 2.65 m², No overhang
Windows facing East: 2.18 m², No overhang
Windows facing South: 1.81 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 1.29 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	63.0000 (1b)	x 2.4000 (2b)	= 151.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.2000 (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					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) = 0.1984 (8)
Pressure test					Yes
Measured/design AP50					4.2400
Infiltration rate					0.4104 (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) =		0.3796 (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												
	0.4840	0.4745	0.4650	0.4176	0.4081	0.3607	0.3607	0.3512	0.3796	0.4081	0.4271	0.4461 (22b)
Effective ac	0.6171	0.6126	0.6081	0.5872	0.5833	0.5650	0.5650	0.5617	0.5721	0.5833	0.5912	0.5995 (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)			4.7100	1.2357	5.8203			(27)					
Opening Type 2 (Uw = 1.20)			1.9300	1.1450	2.2099			(27)					
External Wall 1	59.9800	6.6400	53.3400	0.1500	8.0010			(29a)					
Total net area of external elements Aum(A, m2)			59.9800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	16.0313			(33)					
Party Wall 1			32.9900	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)								21.1959 (36)					
Total fabric heat loss						(33) + (36) =		37.2271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 30.7930	Feb 30.5660	Mar 30.3435	Apr 29.2986	May 29.1031	Jun 28.1929	Jul 28.1929	Aug 28.0244	Sep 28.5435	Oct 29.1031	Nov 29.4986	Dec 29.9121	(38)
Heat transfer coeff	68.0201	67.7931	67.5707	66.5257	66.3302	65.4201	65.4201	65.2515	65.7706	66.3302	66.7257	67.1392	(39)
Average = Sum(39)m / 12 =												66.5248	(39)
HLP	Jan 1.0797	Feb 1.0761	Mar 1.0726	Apr 1.0560	May 1.0529	Jun 1.0384	Jul 1.0384	Aug 1.0357	Sep 1.0440	Oct 1.0529	Nov 1.0591	Dec 1.0657	(40)
HLP (average)												1.0559	(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												2.0651 (42)
Average daily hot water use (litres/day)												83.2452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	91.5697	88.2399	84.9101	81.5803	78.2505	74.9207	74.9207	78.2505	81.5803	84.9101	88.2399	91.5697 (44)
Energy conte	135.7953	118.7674	122.5573	106.8485	102.5236	88.4701	81.9806	94.0739	95.1974	110.9434	121.1034	131.5105 (45)
Energy content (annual)										Total = Sum(45)m =		1309.7714 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.3693	17.8151	18.3836	16.0273	15.3785	13.2705	12.2971	14.1111	14.2796	16.6415	18.1655	19.7266 (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	0.5596	0.4716	0.4683	0.3923	0.3610	0.2983	0.2764	0.3313	0.3495	0.4239	0.4809	0.5419 (61)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total heat required for water heating calculated for each month													
	136.3548	119.2390	123.0256	107.2407	102.8846	88.7684	82.2569	94.4051	95.5469	111.3673	121.5843	132.0524	(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 =				0.0000 (63)
	136.3548	119.2390	123.0256	107.2407	102.8846	88.7684	82.2569	94.4051	95.5469	111.3673	121.5843	132.0524	(64)
									Total per year (kWh/year) = Sum(64)m =				1314.7262 (64)
Heat gains from water heating, kWh/month													
	45.2918	39.6081	40.8674	35.6252	34.1794	29.4909	27.3276	31.3624	31.7405	36.9947	40.3871	43.8627	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.3694	16.3156	13.2687	10.0453	7.5090	6.3394	6.8499	8.9038	11.9506	15.1741	17.7104	18.8800	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	180.4447	182.3171	177.5986	167.5534	154.8732	142.9556	134.9939	133.1215	137.8400	147.8851	160.5654	172.4830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	(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)													
	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	(71)
Water heating gains (Table 5)													
	60.8761	58.9406	54.9293	49.4794	45.9400	40.9596	36.7307	42.1537	44.0840	49.7240	56.0932	58.9553	(72)
Total internal gains	316.6661	314.5492	302.7725	284.0540	265.2981	247.2305	235.5504	241.1549	250.8506	269.7592	291.3449	307.2941	(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	2.1800	19.6403	0.6300	0.7000	0.7700	13.0851 (76)
South	1.8100	46.7521	0.6300	0.7000	0.7700	25.8614 (78)
North	1.9300	10.6334	0.6300	0.7000	0.7700	6.2719 (74)

Solar gains	47.5581	84.4088	124.0718	167.3768	199.3989	203.0592	193.6579	169.0820	139.0101	95.6466	57.5937	40.2863	(83)
Total gains	364.2242	398.9580	426.8443	451.4309	464.6970	450.2897	429.2083	410.2369	389.8606	365.4058	348.9386	347.5804	(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	64.3192	64.5346	64.7470	65.7641	65.9579	66.8755	66.8755	67.0482	66.5190	65.9579	65.5669	65.1631	
alpha	5.2879	5.3023	5.3165	5.3843	5.3972	5.4584	5.4584	5.4699	5.4346	5.3972	5.3711	5.3442	
util living area	0.9983	0.9969	0.9932	0.9800	0.9361	0.8128	0.6437	0.6907	0.9010	0.9845	0.9967	0.9987	(86)
MIT	20.0740	20.1626	20.3186	20.5371	20.7427	20.8901	20.9370	20.9311	20.8331	20.5740	20.2904	20.0626	(87)
Th 2	20.0175	20.0204	20.0233	20.0370	20.0395	20.0514	20.0514	20.0537	20.0468	20.0395	20.0343	20.0289	(88)
util rest of house	0.9978	0.9959	0.9906	0.9717	0.9071	0.7327	0.5185	0.5683	0.8460	0.9765	0.9954	0.9983	(89)
MIT 2	18.7717	18.9034	19.1330	19.4595	19.7464	19.9339	19.9731	19.9721	19.8712	19.5168	19.1015	18.7641	(90)
Living area fraction									fLA = Living area / (4) =			0.4279	(91)
MIT	19.3290	19.4422	19.6404	19.9207	20.1727	20.3431	20.3856	20.3825	20.2829	19.9692	19.6103	19.3198	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1790	19.2922	19.4904	19.7707	20.0227	20.1931	20.2356	20.2325	20.1329	19.8192	19.4603	19.1698	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9971	0.9948	0.9888	0.9687	0.9065	0.7461	0.5441	0.5930	0.8519	0.9740	0.9943	0.9978	(94)
Useful gains	363.1739	396.8936	422.0476	437.3189	421.2367	335.9782	233.5174	243.2868	332.1328	355.9229	346.9471	346.7990	(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													
	1012.0678	975.6956	877.7676	723.1779	552.0469	365.9018	237.8401	250.0758	396.7849	611.5131	824.7494	1005.0598	(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													
	482.7770	388.9550	339.0557	205.8184	97.3228	0.0000	0.0000	0.0000	0.0000	190.1591	344.0177	489.7460	(98)
Space heating												2537.8517	(98)
Space heating per m2										(98) / (4) =		40.2834	(99)

8c. Space cooling requirement

Not applicable

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

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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													2813.5828 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	482.7770	388.9550	339.0557	205.8184	97.3228	0.0000	0.0000	0.0000	0.0000	190.1591	344.0177	489.7460	(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)	535.2295	431.2139	375.8933	228.1801	107.8967	0.0000	0.0000	0.0000	0.0000	210.8194	381.3943	542.9557	(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	136.3548	119.2390	123.0256	107.2407	102.8846	88.7684	82.2569	94.4051	95.5469	111.3673	121.5843	132.0524	(64)
Efficiency of water heater (217)m	86.7491	86.5326	86.0612	84.9440	82.5385	76.4000	76.4000	76.4000	76.4000	84.5587	86.1371	86.8677	(217)
Fuel for water heating, kWh/month	157.1831	137.7966	142.9513	126.2487	124.6505	116.1890	107.6662	123.5669	125.0614	131.7041	141.1521	152.0155	(219)
Water heating fuel used												1586.1852	(219)
Annual totals kWh/year													
Space heating fuel - main system												2813.5828	(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)												324.4099	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.29 * 951 * 0.80) =										-784.8286		-784.8286	(233)
Total delivered energy for all uses												4014.3493	(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	2813.5828	0.2160	607.7339	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1586.1852	0.2160	342.6160	(264)
Space and water heating			950.3499	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	324.4099	0.5190	168.3687	(268)
Energy saving/generation technologies				
PV Unit	-784.8286	0.5190	-407.3260	(269)
Total CO2, kg/year			750.3176	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9100	(273)

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

DER			11.9100	ZC1
Total Floor Area		TFA	63.0000	
Assumed number of occupants		N	2.0651	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.9727	ZC2
CO2 emissions from cooking, equation (L16)			2.6756	ZC3
Total CO2 emissions			31.5582	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			31.5582	ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.0000 (1b)	x 2.4000 (2b)	= 151.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.2000 (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) = 0.1323 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3823 (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) = 0.3536 (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	0.4508	0.4420	0.4332	0.3890	0.3801	0.3359	0.3359	0.3271	0.3536	0.3801	0.3978	0.4155 (22b)
Effective ac	0.6016	0.5977	0.5938	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5863 (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)					6.6400		1.3258		8.8030				(27)	
External Wall 1	59.9800		6.6400		53.3400		0.1800		9.6012				(29a)	
Total net area of external elements Aum(A, m2)					59.9800								(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =				18.4042				(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													21.3938 (36)	
Total fabric heat loss													(33) + (36) = 39.7980 (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	30.0190	29.8221	29.6291	28.7225	28.5529	27.7633	27.7633	27.6170	28.0674	28.5529	28.8960	29.2547	(38)	
Heat transfer coeff	69.8170	69.6201	69.4271	68.5205	68.3509	67.5613	67.5613	67.4151	67.8654	68.3509	68.6940	69.0528	(39)	
Average = Sum(39)m / 12 =												68.5197	(39)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP	1.1082	1.1051	1.1020	1.0876	1.0849	1.0724	1.0724	1.0701	1.0772	1.0849	1.0904	1.0961	(40)	
HLP (average)												1.0876	(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												
Average daily hot water use (litres/day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.5697	88.2399	84.9101	81.5803	78.2505	74.9207	74.9207	78.2505	81.5803	84.9101	88.2399	91.5697 (44)
Energy conte	135.7953	118.7674	122.5573	106.8485	102.5236	88.4701	81.9806	94.0739	95.1974	110.9434	121.1034	131.5105 (45)
Energy content (annual)										Total = Sum(45)m =		1309.7714 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3693	17.8151	18.3836	16.0273	15.3785	13.2705	12.2971	14.1111	14.2796	16.6415	18.1655	19.7266 (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	46.6629	40.6145	43.2693	40.2314	39.8756	36.9472	38.1788	39.8756	40.2314	43.2693	43.5156	46.6629 (61)
Total heat required for water heating calculated for each month												
	182.4582	159.3820	165.8266	147.0798	142.3992	125.4173	120.1593	133.9495	135.4288	154.2127	164.6190	178.1734 (62)

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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	0.0000 (63)
Output from w/h	Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
	182.4582	159.3820	165.8266	147.0798	142.3992	125.4173	120.1593	133.9495	135.4288	154.2127	164.6190	178.1734	178.1734 (64)
	Total per year (kWh/year) = Sum(64)m = 1809.1059 (64)												
Heat gains from water heating, kWh/month													
	56.8177	49.6438	51.5676	45.5850	44.0580	38.6531	36.8032	41.2485	41.7110	47.7060	51.1458	55.3930	55.3930 (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	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	103.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3694	16.3156	13.2687	10.0453	7.5090	6.3394	6.8499	8.9038	11.9506	15.1741	17.7104	18.8800	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.4447	182.3171	177.5986	167.5534	154.8732	142.9556	134.9939	133.1215	137.8400	147.8851	160.5654	172.4830	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	33.3253	(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)	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	-82.6025	(71)
Water heating gains (Table 5)	76.3678	73.8747	69.3113	63.3124	59.2178	53.6849	49.4667	55.4415	57.9319	64.1210	71.0358	74.4529	(72)
Total internal gains	332.1578	329.4833	317.1546	297.8871	278.5759	259.9558	248.2865	254.4427	264.6985	284.1561	306.2875	322.7918	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	
North	2.6500	10.6334	0.6300	0.7000	0.7700	8.6117 (74)
East	2.1800	19.6403	0.6300	0.7000	0.7700	13.0851 (76)
South	1.8100	46.7521	0.6300	0.7000	0.7700	25.8614 (78)

Solar gains	47.5581	84.4088	124.0718	167.3768	199.3989	203.0592	193.6579	169.0820	139.0101	95.6466	57.5937	40.2863	(83)
Total gains	379.7160	413.8921	441.2264	465.2639	477.9747	463.0150	441.9443	423.5247	403.7085	379.8027	363.8812	363.0780	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.6638	62.8411	63.0158	63.8495	64.0079	64.7560	64.7560	64.8965	64.4658	64.0079	63.6882	63.3574	
alpha	5.1776	5.1894	5.2011	5.2566	5.2672	5.3171	5.3171	5.3264	5.2977	5.2672	5.2459	5.2238	
util living area	0.9980	0.9964	0.9923	0.9784	0.9336	0.8115	0.6435	0.6889	0.8965	0.9825	0.9961	0.9984	(86)
MIT	19.8178	19.9351	20.1445	20.4362	20.7143	20.9144	20.9805	20.9723	20.8393	20.4906	20.1072	19.7992	(87)
Th 2	19.9941	19.9967	19.9992	20.0110	20.0132	20.0234	20.0234	20.0253	20.0195	20.0132	20.0087	20.0040	(88)
util rest of house	0.9973	0.9952	0.9894	0.9694	0.9035	0.7297	0.5152	0.5636	0.8391	0.9735	0.9945	0.9979	(89)
MIT 2	18.4166	18.5897	18.8964	19.3256	19.7118	19.9602	20.0155	20.0127	19.8802	19.4085	18.8501	18.3965	(90)
Living area fraction									fLA = Living area / (4) =			0.4279	(91)
MIT	19.0162	19.1655	19.4305	19.8009	20.1408	20.3685	20.4285	20.4233	20.2906	19.8716	19.3881	18.9968	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0162	19.1655	19.4305	19.8009	20.1408	20.3685	20.4285	20.4233	20.2906	19.8716	19.3881	18.9968	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9938	0.9872	0.9670	0.9081	0.7614	0.5707	0.6176	0.8575	0.9718	0.9931	0.9971	(94)
Useful gains	378.3300	411.3098	435.5788	449.8982	434.0343	352.5240	252.2226	261.5728	346.1769	369.1080	361.3623	362.0244	(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	1027.4415	993.1622	897.7263	746.9346	576.9364	389.7300	258.6567	271.2332	420.1297	633.7187	844.1159	1021.7597	(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	482.9390	391.0048	343.8378	213.8662	106.3192	0.0000	0.0000	0.0000	0.0000	196.8704	347.5826	490.8431	(98)
Space heating												2573.2630	(98)
Space heating per m2												40.8454	(99)
										(98) / (4) =			

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)
Fraction of space heat from main system(s)	1.0000 (202)

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Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2755.0996 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	482.9390	391.0048	343.8378	213.8662	106.3192	0.0000	0.0000	0.0000	0.0000	196.8704	347.5826	490.8431 (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)	517.0653	418.6347	368.1347	228.9788	113.8321	0.0000	0.0000	0.0000	0.0000	210.7820	372.1441	525.5280 (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	182.4582	159.3820	165.8266	147.0798	142.3992	125.4173	120.1593	133.9495	135.4288	154.2127	164.6190	178.1734 (64)
Efficiency of water heater	87.3861	87.2231	86.8459	85.9926	84.3274	80.3000	80.3000	80.3000	80.3000	85.6671	86.8876	80.3000 (216)
Fuel for water heating, kWh/month	208.7955	182.7291	190.9434	171.0377	168.8647	156.1859	149.6380	166.8113	168.6536	180.0140	189.4620	203.6966 (219)
Water heating fuel used												2136.8319 (219)
Annual totals kWh/year												
Space heating fuel - main system												2755.0996 (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)												324.4099 (232)
Total delivered energy for all uses												5291.3414 (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	2755.0996	0.2160	595.1015 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2136.8319	0.2160	461.5557 (264)
Space and water heating			1056.6572 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	324.4099	0.5190	168.3687 (268)
Total CO2, kg/m2/year			1263.9509 (272)
Emissions per m2 for space and water heating			16.7723 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6725 (272b)
Emissions per m2 for pumps and fans			0.6179 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.7723 * 1.00) + 2.6725 + 0.6179, rounded to 2 d.p.			20.0600 (273)

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Property Reference	J02855 Flat 4			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 4	Prop Type Ref	As Built		
Property	Flat 4, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	89 B	DER	11.94	TER	18.95
Environmental	92 A	% DER<TER	37.00		
CO ₂ Emissions (t/year)	0.58	DFEE	43.94	TFEE	51.47
General Requirements Compliance	Pass	% DFEE<TFEE	14.62		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@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) 11.94 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 1.29 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												
Effective ac	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)												
(38)m	Jan 39.2975	Feb 39.0171	Mar 38.7422	Apr 37.4512	May 37.2096	Jun 36.0852	Jul 36.0852	Aug 35.8770	Sep 36.5183	Oct 37.2096	Nov 37.6983	Dec 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)
HLP	Jan 1.1319	Feb 1.1280	Mar 1.1242	Apr 1.1063	May 1.1029	Jun 1.0873	Jul 1.0873	Aug 1.0844	Sep 1.0933	Oct 1.1029	Nov 1.1097	Dec 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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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 (92)
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 (93)
Temperature adjustment												-0.1500
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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										(98) / (4) =		39.8294 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												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 (217)m	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												1689.7102 (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 * 1.29 * 951 * 0.80) =												-784.8286
Total delivered energy for all uses												-784.8286 (233)
												4498.5630 (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	-784.8286	0.5190	-407.3260 (269)
Total CO2, kg/year			859.4480 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9400 (273)

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

DER		11.9400 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		30.9758 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		30.9758 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	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)
Effective ac	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 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)			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, m2)			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/m2K							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	Jan 39.3695	Feb 39.0863	Mar 38.8087	Apr 37.5048	May 37.2608	Jun 36.1251	Jul 36.1251	Aug 35.9148	Sep 36.5626	Oct 37.2608	Nov 37.7543	Dec 38.2703 (38)
Heat transfer coeff	82.5216	82.2384	81.9607	80.6568	80.4129	79.2772	79.2772	79.0669	79.7146	80.4129	80.9064	81.4224 (39)
Average = Sum(39)m / 12 =												80.6557 (39)
HLP	Jan 1.1461	Feb 1.1422	Mar 1.1383	Apr 1.1202	May 1.1168	Jun 1.1011	Jul 1.1011	Aug 1.0982	Sep 1.1071	Oct 1.1168	Nov 1.1237	Dec 1.1309 (40)
HLP (average)												1.1202 (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)
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	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 per m2												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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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 5			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 5	Prop Type Ref	As Built		
Property	Flat 5, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	89 B	DER	11.75	TER	19.51
Environmental	93 A	% DER<TER	39.79		
CO ₂ Emissions (t/year)	0.50	DFEE	40.70	TFEE	49.35
General Requirements Compliance	Pass	% DFEE<TFEE	17.53		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	f764-0001
Client					

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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 65 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) 19.51 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.75 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 49.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.7 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	0.13 (max. 0.25)	0.13 (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: 3.28 (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 South: 0.90 m², No overhang
Windows facing West: 3.74 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value: 0.00 W/m²K
Air permeability: 3.3 m³/m²h
Photovoltaic array: 1.29 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	65.0000 (1b)	x 2.4000 (2b)	= 156.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.0000 (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					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) =					30.0000 / (5) = 0.1923 (8)
Pressure test					Yes
Measured/design AP50					3.2800
Infiltration rate					0.3563 (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) = 0.3296 (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	0.4202	0.4120	0.4037	0.3625	0.3543	0.3131	0.3131	0.3049	0.3296	0.3543	0.3708	0.3873 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5657	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5687	0.5750 (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)			2.7100	1.2357	3.3489		(27)
Opening Type 2 (Uw = 1.20)			1.9300	1.1450	2.2099		(27)
Heat Loss Floor 1			51.9000	0.1300	6.7470		(28a)
External Wall 1	26.8800	4.6400	22.2400	0.1500	3.3360		(29a)
Total net area of external elements Aum(A, m ²)			78.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.6418		(33)
Party Wall 1			65.6600	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)							20.6023 (36)
Total fabric heat loss							(33) + (36) = 36.2441 (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	30.2853	30.1088	29.9358	29.1232	28.9712	28.2634	28.2634	28.1324	28.5360	28.9712	29.2787	29.6003 (38)
Heat transfer coeff	66.5294	66.3529	66.1799	65.3673	65.2153	64.5075	64.5075	64.3765	64.7801	65.2153	65.5228	65.8444 (39)
Average = Sum(39)m / 12 =												65.3666 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0235	1.0208	1.0182	1.0057	1.0033	0.9924	0.9924	0.9904	0.9966	1.0033	1.0080	1.0130 (40)
HLP (average)												1.0056 (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												2.1189 (42)
Average daily hot water use (litres/day)												84.5243 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	92.9767	89.5957	86.2148	82.8338	79.4528	76.0718	76.0718	79.4528	82.8338	86.2148	89.5957	92.9767 (44)
Energy conte	137.8817	120.5923	124.4404	108.4902	104.0989	89.8294	83.2402	95.5193	96.6601	112.6480	122.9642	133.5311 (45)
Energy content (annual)										Total = Sum(45)m =		1329.8958 (45)
Distribution loss (46)m = 0.15 x (45)m	20.6823	18.0888	18.6661	16.2735	15.6148	13.4744	12.4860	14.3279	14.4990	16.8972	18.4446	20.0297 (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)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	0.5769	0.4862	0.4828	0.4044	0.3722	0.3075	0.2850	0.3415	0.3603	0.4370	0.4958	0.5587 (61)
Total heat required for water heating calculated for each month	138.4586	121.0785	124.9232	108.8946	104.4711	90.1369	83.5251	95.8608	97.0204	113.0851	123.4599	134.0898 (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	138.4586	121.0785	124.9232	108.8946	104.4711	90.1369	83.5251	95.8608	97.0204	113.0851	123.4599	134.0898 (64)
Heat gains from water heating, kWh/month	45.9899	40.2185	41.4971	36.1741	34.7059	29.9452	27.7486	31.8456	32.2296	37.5647	41.0095	44.5388 (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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3587	18.0824	14.7056	11.1331	8.3221	7.0259	7.5917	9.8680	13.2448	16.8173	19.6283	20.9245	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	(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)	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	(71)
Water heating gains (Table 5)	61.8144	59.8489	55.7757	50.2418	46.6478	41.5905	37.2965	42.8032	44.7633	50.4902	56.9577	59.8639	(72)
Total internal gains	325.3155	322.9972	310.7001	291.2750	271.8445	253.2488	241.3421	247.2016	257.3856	277.0037	299.3077	315.7523	(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
South	0.9000	46.7521	0.6300	0.7000	0.7700	12.8592 (78)
West	1.8100	19.6403	0.6300	0.7000	0.7700	10.8642 (80)
West	1.9300	19.6403	0.6300	0.7000	0.7700	11.5845 (80)

Solar gains	35.3079	64.9745	99.1476	135.7956	160.8596	162.7312	155.6875	137.0652	112.1358	74.8234	43.2334	29.5723 (83)
Total gains	360.6234	387.9717	409.8477	427.0706	432.7041	415.9800	397.0296	384.2668	369.5214	351.8272	342.5411	345.3246 (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	67.8480	68.0285	68.2063	69.0542	69.2152	69.9746	69.9746	70.1171	69.6801	69.2152	68.8903	68.5539	
alpha	5.5232	5.5352	5.5471	5.6036	5.6143	5.6650	5.6650	5.6745	5.6453	5.6143	5.5927	5.5703	
util living area	0.9986	0.9977	0.9949	0.9852	0.9518	0.8467	0.6808	0.7217	0.9175	0.9878	0.9974	0.9989	(86)
MIT	20.1179	20.1949	20.3383	20.5395	20.7349	20.8844	20.9369	20.9311	20.8315	20.5834	20.3183	20.1052	(87)
Th 2	20.0638	20.0660	20.0682	20.0786	20.0806	20.0897	20.0897	20.0913	20.0862	20.0806	20.0766	20.0725	(88)
util rest of house	0.9982	0.9969	0.9929	0.9789	0.9286	0.7740	0.5569	0.6023	0.8692	0.9814	0.9963	0.9986	(89)
MIT 2	18.8727	18.9871	19.1980	19.4980	19.7737	19.9668	20.0128	20.0111	19.9069	19.5645	19.1762	18.8612	(90)
Living area fraction	19.3059	19.4072	19.5947	19.8603	20.1080	20.2860	20.3343	20.3311	20.2285	19.9189	19.5735	19.2939	(91)
Temperature adjustment	19.1559	19.2572	19.4447	19.7103	19.9580	20.1360	20.1843	20.1811	20.0785	19.7689	19.4235	19.1439	(92)
adjusted MIT	19.1559	19.2572	19.4447	19.7103	19.9580	20.1360	20.1843	20.1811	20.0785	19.7689	19.4235	19.1439	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9976	0.9959	0.9912	0.9756	0.9248	0.7783	0.5707	0.6152	0.8687	0.9784	0.9952	0.9981	(94)
Ext temp.	359.7481	386.3742	406.2395	416.6426	400.1562	323.7579	226.5716	236.3931	321.0120	344.2268	340.9054	344.6672	(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	988.3516	952.6438	856.6765	706.6373	538.5496	357.1143	231.2125	243.4147	387.2907	597.9520	807.4678	983.9721	(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	467.6810	380.5332	335.1252	208.7962	102.9647	0.0000	0.0000	0.0000	0.0000	188.7716	335.9249	475.6429	(98)
												2495.4396	(98)
												38.3914	(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													2766.5627 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.6810	380.5332	335.1252	208.7962	102.9647	0.0000	0.0000	0.0000	0.0000	188.7716	335.9249	475.6429	(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)	518.4933	421.8772	371.5357	231.4813	114.1516	0.0000	0.0000	0.0000	0.0000	209.2811	372.4223	527.3202	(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	138.4586	121.0785	124.9232	108.8946	104.4711	90.1369	83.5251	95.8608	97.0204	113.0851	123.4599	134.0898	(64)
Efficiency of water heater (217)m	86.6258	86.4316	85.9827	84.9410	82.6787	76.4000	76.4000	76.4000	76.4000	84.4831	86.0241	86.7539	(217)
Fuel for water heating, kWh/month	159.8354	140.0859	145.2888	128.2003	126.3579	117.9803	109.3261	125.4723	126.9901	133.8553	143.5179	154.5635	(219)
Water heating fuel used												1611.4736	(219)
Annual totals kWh/year													
Space heating fuel - main system												2766.5627	(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)												359.5407	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.29 * 951 * 0.80) =										-784.8286		-784.8286	(233)
Total delivered energy for all uses												4027.7484	(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	2766.5627	0.2160	597.5775	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1611.4736	0.2160	348.0783	(264)
Space and water heating			945.6558	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	359.5407	0.5190	186.6016	(268)
Energy saving/generation technologies				
PV Unit	-784.8286	0.5190	-407.3260	(269)
Total CO2, kg/year			763.8564	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.7500	(273)

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

DER			11.7500	ZC1
Total Floor Area		TFA	65.0000	
Assumed number of occupants		N	2.1189	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.8984	ZC2
CO2 emissions from cooking, equation (L16)			2.6131	ZC3
Total CO2 emissions			31.2615	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			31.2615	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	65.0000 (1b)	x 2.4000 (2b)	= 156.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.0000 (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) = 0.1282 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3782 (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) = 0.3498 (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	0.4460	0.4373	0.4286	0.3848	0.3761	0.3323	0.3323	0.3236	0.3498	0.3761	0.3936	0.4111 (22b)
Effective ac	0.5995	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5524	0.5612	0.5707	0.5774	0.5845 (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)			4.6400	1.3258	6.1515		(27)					
Heat Loss Floor 1			51.9000	0.1300	6.7470		(28a)					
External Wall 1	26.8800	4.6400	22.2400	0.1800	4.0032		(29a)					
Total net area of external elements Aum(A, m2)			78.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		16.9017		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.9405 (36)					
Total fabric heat loss							(33) + (36) = 36.8422 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.8611	30.6623	30.4674	29.5518	29.3805	28.5831	28.5831	28.4354	28.8903	29.3805	29.7271	30.0893 (38)
	67.7034	67.5045	67.3096	66.3940	66.2227	65.4253	65.4253	65.2777	65.7325	66.2227	66.5693	66.9315 (39)
Average = Sum(39)m / 12 =												66.3932 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0416	1.0385	1.0355	1.0214	1.0188	1.0065	1.0065	1.0043	1.0113	1.0188	1.0241	1.0297 (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												2.1189 (42)
Average daily hot water use (litres/day)												84.5243 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	92.9767	89.5957	86.2148	82.8338	79.4528	76.0718	76.0718	79.4528	82.8338	86.2148	89.5957	92.9767 (44)
Energy content (annual)	137.8817	120.5923	124.4404	108.4902	104.0989	89.8294	83.2402	95.5193	96.6601	112.6480	122.9642	133.5311 (45)
Distribution loss (46)m = 0.15 x (45)m	20.6823	18.0888	18.6661	16.2735	15.6148	13.4744	12.4860	14.3279	14.4990	16.8972	18.4446	20.0297 (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	47.3799	41.2386	43.9341	40.8495	40.4883	37.5149	38.7654	40.4883	40.8495	43.9341	44.1842	47.3799 (61)
Total heat required for water heating calculated for each month												

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Solar input	185.2617	161.8308	168.3745	149.3397	144.5872	127.3443	122.0055	136.0076	137.5097	156.5821	167.1483	180.9110 (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	185.2617	161.8308	168.3745	149.3397	144.5872	127.3443	122.0055	136.0076	137.5097	156.5821	167.1483	180.9110 (64)
Heat gains from water heating, kWh/month	57.6907	50.4066	52.3600	46.2854	44.7350	39.2470	37.3687	41.8822	42.3519	48.4390	51.9316	56.2441 (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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3587	18.0824	14.7056	11.1331	8.3221	7.0259	7.5917	9.8680	13.2448	16.8173	19.6283	20.9245 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946 (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)	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567 (71)
Water heating gains (Table 5)	77.5412	75.0098	70.3763	64.2852	60.1276	54.5097	50.2267	56.2933	58.8220	65.1062	72.1273	75.5969 (72)
Total internal gains	341.0423	338.1580	325.3007	305.3184	285.3243	266.1680	254.2724	260.6918	271.4443	291.6197	314.4773	331.4853 (73)

6. Solar gains

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
South				0.9000	46.7521	0.6300		0.7000		0.7700		12.8592 (78)
West				3.7400	19.6403	0.6300		0.7000		0.7700		22.4487 (80)
Solar gains	35.3079	64.9745	99.1476	135.7956	160.8596	162.7312	155.6875	137.0652	112.1358	74.8234	43.2334	29.5723 (83)
Total gains	376.3502	403.1325	424.4483	441.1140	446.1839	428.8992	409.9599	397.7570	383.5801	366.4431	357.7107	361.0575 (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	66.6716	66.8680	67.0616	67.9864	68.1622	68.9930	68.9930	69.1491	68.6706	68.1622	67.8074	67.4404
alpha	5.4448	5.4579	5.4708	5.5324	5.5441	5.5995	5.5995	5.6099	5.5780	5.5441	5.5205	5.4960
util living area	0.9983	0.9972	0.9940	0.9833	0.9475	0.8381	0.6702	0.7096	0.9093	0.9856	0.9968	0.9987 (86)
MIT	19.8873	19.9900	20.1824	20.4532	20.7141	20.9121	20.9805	20.9733	20.8447	20.5152	20.1589	19.8716 (87)
Th 2	20.0488	20.0513	20.0538	20.0655	20.0677	20.0779	20.0779	20.0798	20.0740	20.0677	20.0633	20.0586 (88)
util rest of house	0.9978	0.9962	0.9918	0.9763	0.9227	0.7632	0.5457	0.5893	0.8577	0.9782	0.9955	0.9982 (89)
MIT 2	18.5576	18.7096	18.9919	19.3923	19.7588	20.0104	20.0696	20.0671	19.9357	19.4855	18.9655	18.5419 (90)
Living area fraction									fLA = Living area / (4) =			0.3478 (91)
MIT	19.0201	19.1550	19.4060	19.7613	20.0911	20.3241	20.3865	20.3823	20.2519	19.8437	19.3806	19.0044 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0201	19.1550	19.4060	19.7613	20.0911	20.3241	20.3865	20.3823	20.2519	19.8437	19.3806	19.0044 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9969	0.9949	0.9897	0.9733	0.9234	0.7855	0.5895	0.6314	0.8694	0.9758	0.9941	0.9975 (94)
Useful gains	375.1815	401.0955	420.0915	429.3478	412.0169	336.9197	241.6719	251.1414	333.4999	357.5827	355.6023	360.1628 (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	996.6027	962.2748	868.6994	721.1263	555.6845	374.4990	247.7297	259.9561	404.3800	612.1416	817.5107	990.8834 (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	462.3373	377.1125	333.7643	210.0805	106.8887	0.0000	0.0000	0.0000	0.0000	189.3919	332.5741	469.2561 (98)
Space heating												2481.4054 (98)
Space heating per m2										(98) / (4) =		38.1755 (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)
Fraction of space heat from main system(s)	1.0000 (202)

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Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2656.7509 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	462.3373	377.1125	333.7643	210.0805	106.8887	0.0000	0.0000	0.0000	0.0000	189.3919	332.5741	469.2561 (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)	495.0079	403.7607	357.3493	224.9256	114.4419	0.0000	0.0000	0.0000	0.0000	202.7750	356.0750	502.4156 (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	185.2617	161.8308	168.3745	149.3397	144.5872	127.3443	122.0055	136.0076	137.5097	156.5821	167.1483	180.9110 (64)
Efficiency of water heater	87.2602	87.1100	86.7416	85.9102	84.3034	80.3000	80.3000	80.3000	80.3000	85.5311	86.7504	87.3431 (217)
Fuel for water heating, kWh/month	212.3094	185.7775	194.1103	173.8323	171.5080	158.5857	151.9372	169.3743	171.2449	183.0704	192.6774	207.1267 (219)
Water heating fuel used												2171.5542 (219)
Annual totals kWh/year												
Space heating fuel - main system												2656.7509 (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)												359.5407 (232)
Total delivered energy for all uses												5262.8458 (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	2656.7509	0.2160	573.8582 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2171.5542	0.2160	469.0557 (264)
Space and water heating			1042.9139 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	359.5407	0.5190	186.6016 (268)
Total CO2, kg/m2/year			1268.4405 (272)
Emissions per m2 for space and water heating			16.0448 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.8708 (272b)
Emissions per m2 for pumps and fans			0.5988 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0448 * 1.00) + 2.8708 + 0.5988, rounded to 2 d.p.			19.5100 (273)

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Property Reference	J02855 Flat 6			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 6	Prop Type Ref	As Built		
Property	Flat 6, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	88 B	DER	13.62	TER	21.02
Environmental	91 B	% DER<TER	35.21		
CO ₂ Emissions (t/year)	0.66	DFEE	48.33	TFEE	59.15
General Requirements Compliance	Pass	% DFEE<TFEE	18.30		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	f764-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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DWELLING AS BUILT

Mid-floor flat, total floor area 70 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) 21.02 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.62 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)48.3 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	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.27 (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: 2.00 (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: 3.74 m², No overhang
Windows facing East: 0.90 m², No overhang
Windows facing West: 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
Air permeability 2.0 m³/m²h
Photovoltaic array 1.29 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	70.0000 (1b)	x 2.4000 (2b)	= 168.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.0000 (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) = 0.1786 (8)
Pressure test					Yes
Measured/design AP50					2.0000
Infiltration rate					0.2786 (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) =		0.2577 (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	0.3285	0.3221	0.3157	0.2834	0.2770	0.2448	0.2448	0.2384	0.2577	0.2770	0.2899	0.3028 (22b)
Effective ac	0.5540	0.5519	0.5498	0.5402	0.5384	0.5300	0.5300	0.5284	0.5332	0.5384	0.5420	0.5458 (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)			3.6100	1.2357	4.4610		(27)					
Opening Type 2 (Uw = 1.20)			1.9300	1.1450	2.2099		(27)					
Heat Loss Floor 1			70.0000	0.1500	10.5000		(28a)					
External Wall 1	61.0600	5.5400	55.5200	0.1500	8.3280		(29a)					
Total net area of external elements Aum(A, m2)			131.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.4990		(33)					
Party Wall 1			50.1600	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)							21.3484 (36)					
Total fabric heat loss						(33) + (36) =	46.8474 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.7121	Feb 30.5959	Mar 30.4820	Apr 29.9471	May 29.8470	Jun 29.3811	Jul 29.3811	Aug 29.2948	Sep 29.5606	Oct 29.8470	Nov 30.0495	Dec 30.2611 (38)
Heat transfer coeff	77.5594	77.4432	77.3294	76.7944	76.6944	76.2285	76.2285	76.1422	76.4079	76.6944	76.8968	77.1085 (39)
Average = Sum(39)m / 12 =												76.7940 (39)
HLP	Jan 1.1080	Feb 1.1063	Mar 1.1047	Apr 1.0971	May 1.0956	Jun 1.0890	Jul 1.0890	Aug 1.0877	Sep 1.0915	Oct 1.0956	Nov 1.0985	Dec 1.1015 (40)
HLP (average)												1.0971 (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												2.2461 (42)
Average daily hot water use (litres/day)												87.5455 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000 (44)
Energy content (annual)	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456 (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

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	0.6189	0.5216	0.5179	0.4338	0.3993	0.3299	0.3057	0.3664	0.3865	0.4688	0.5318	0.5993 (61)
Total heat required for water heating calculated for each month	143.4290	125.4242	129.4063	112.8018	108.2190	93.3701	86.5212	99.2999	100.5016	117.1433	127.8912	138.9033 (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	143.4290	125.4242	129.4063	112.8018	108.2190	93.3701	86.5212	99.2999	100.5016	117.1433	127.8912	138.9033 (64)
Heat gains from water heating, kWh/month	47.6391	41.6605	42.9849	37.4708	35.9499	31.0184	28.7431	32.9870	33.3849	38.9115	42.4799	46.1359 (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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.2743	18.8957	15.3670	11.6338	8.6964	7.3419	7.9331	10.3118	13.8405	17.5737	20.5111	21.8656	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(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)	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(71)
Water heating gains (Table 5)	64.0310	61.9948	57.7753	52.0428	48.3197	43.0811	38.6332	44.3373	46.3679	52.3004	58.9999	62.0106	(72)
Total internal gains	342.2943	339.9268	327.0194	306.5703	286.0454	266.4216	253.8597	259.8952	270.6136	291.2626	314.7640	332.1599	(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					1.8100	10.6334	0.6300	0.7000	0.7700		5.8820 (74)	
East					0.9000	19.6403	0.6300	0.7000	0.7700		5.4021 (76)	
West					0.9000	19.6403	0.6300	0.7000	0.7700		5.4021 (80)	
North					1.9300	10.6334	0.6300	0.7000	0.7700		6.2719 (74)	

Solar gains	22.9581	44.3620	74.2746	114.1591	147.6122	155.1085	145.9862	119.7996	87.9348	52.7271	28.4649	19.0169 (83)
Total gains	365.2523	384.2887	401.2940	420.7294	433.6576	421.5300	399.8459	379.6948	358.5485	343.9897	343.2289	351.1768 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.6760	62.7700	62.8624	63.3003	63.3829	63.7703	63.7703	63.8425	63.6205	63.3829	63.2160	63.0425	
alpha	5.1784	5.1847	5.1908	5.2200	5.2255	5.2514	5.2514	5.2562	5.2414	5.2255	5.2144	5.2028	
util living area	0.9990	0.9985	0.9969	0.9912	0.9695	0.8946	0.7583	0.8044	0.9534	0.9929	0.9982	0.9992	(86)
MIT	20.0042	20.0721	20.2159	20.4276	20.6504	20.8356	20.9155	20.9027	20.7596	20.4845	20.2102	19.9889	(87)
Th 2	19.9943	19.9957	19.9970	20.0032	20.0044	20.0098	20.0098	20.0109	20.0077	20.0044	20.0020	19.9996	(88)
util rest of house	0.9986	0.9979	0.9957	0.9872	0.9529	0.8307	0.6246	0.6819	0.9193	0.9890	0.9974	0.9989	(89)
MIT 2	18.6514	18.7519	18.9631	19.2762	19.5953	19.8414	19.9190	19.9113	19.7505	19.3611	18.9591	18.6332	(90)
Living area fraction									fLA = Living area / (4) =			0.3437	(91)
MIT	19.1164	19.2057	19.3937	19.6720	19.9580	20.1831	20.2615	20.2521	20.0973	19.7472	19.3891	19.0992	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9664	19.0557	19.2437	19.5220	19.8080	20.0331	20.1115	20.1021	19.9473	19.5972	19.2391	18.9492	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9972	0.9944	0.9845	0.9485	0.8325	0.6402	0.6951	0.9165	0.9866	0.9966	0.9985	(94)
Useful gains	364.5606	383.1985	399.0414	414.1944	411.3332	350.9368	255.9671	263.9247	328.6160	339.3900	342.0495	350.6395	(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	1137.5173	1096.2626	985.4652	815.7075	621.8372	414.1565	267.6751	281.8828	446.7823	690.0358	933.4583	1137.2896	(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	575.0798	479.1791	436.2993	289.0894	156.6150	0.0000	0.0000	0.0000	0.0000	260.8804	425.8143	585.2677	(98)
Space heating												3208.2250	(98)
Space heating per m2											(98) / (4) =	45.8318	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3556.7904 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	575.0798	479.1791	436.2993	289.0894	156.6150	0.0000	0.0000	0.0000	0.0000	260.8804	425.8143	585.2677	(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)	637.5607	531.2407	483.7021	320.4982	173.6308	0.0000	0.0000	0.0000	0.0000	289.2244	472.0780	648.8555	(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	143.4290	125.4242	129.4063	112.8018	108.2190	93.3701	86.5212	99.2999	100.5016	117.1433	127.8912	138.9033	(64)
Efficiency of water heater (217)m	87.0608	86.9422	86.6209	85.8477	84.0000	76.4000	76.4000	76.4000	76.4000	85.4188	86.5875	87.1795	(216)
Fuel for water heating, kWh/month	164.7457	144.2617	149.3938	131.3976	128.8323	122.2122	113.2476	129.9737	131.5466	137.1400	147.7016	159.3302	(219)
Water heating fuel used												1659.7830	(219)
Annual totals kWh/year													
Space heating fuel - main system												3556.7904	(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)												375.7110	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.29 * 951 * 0.80) =										-784.8286		-784.8286	(233)
Total delivered energy for all uses												4882.4559	(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	3556.7904	0.2160	768.2667 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1659.7830	0.2160	358.5131 (264)
Space and water heating			1126.7799 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	375.7110	0.5190	194.9940 (268)
Energy saving/generation technologies			
PV Unit	-784.8286	0.5190	-407.3260 (269)
Total CO2, kg/year			953.3729 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.6200 (273)

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

DER		13.6200	ZC1
Total Floor Area		70.0000	
Assumed number of occupants		2.2461	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.7020	ZC2
CO2 emissions from cooking, equation (L16)		2.4701	ZC3
Total CO2 emissions		32.7921	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		32.7921	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	70.0000 (1b)	x 2.4000 (2b)	= 168.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 168.0000 (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) =					20.0000 / (5) = 0.1190 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3690 (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) = 0.3414 (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	0.4352	0.4267	0.4182	0.3755	0.3670	0.3243	0.3243	0.3158	0.3414	0.3670	0.3840	0.4011 (22b)
	0.5947	0.5910	0.5874	0.5705	0.5673	0.5526	0.5526	0.5499	0.5583	0.5673	0.5737	0.5804 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings		NetArea		U-value		A x U		K-value		A x K	
	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K	
TER Opening Type (Uw = 1.40)					5.5400		1.3258		7.3447				(27)	
Heat Loss Floor 1					70.0000		0.1300		9.1000				(28a)	
External Wall 1	61.0600		5.5400		55.5200		0.1800		9.9936				(29a)	
Total net area of external elements Aum(A, m2)					131.0600								(31)	
Fabric heat loss, W/K = Sum (A x U)							(26) ... (30) + (32) =		26.4383				(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K														250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														21.1303 (36)
Total fabric heat loss														(33) + (36) = 47.5686 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)														
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat transfer coeff	32.9712	32.7673	32.5675	31.6287	31.4530	30.6353	30.6353	30.4839	30.9503	31.4530	31.8083	32.1798	(38)	
Average = Sum(39)m / 12 =	80.5398	80.3359	80.1361	79.1972	79.0216	78.2039	78.2039	78.0525	78.5189	79.0216	79.3769	79.7484	(39)	
													(39)	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.1506	1.1477	1.1448	1.1314	1.1289	1.1172	1.1172	1.1150	1.1217	1.1289	1.1340	1.1393	(40)	
Days in month													(40)	
	31	28	31	30	31	30	31	31	30	31	30	31	(41)	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2461 (42)
Average daily hot water use (litres/day)												87.5455 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.3000	92.7982	89.2964	85.7946	82.2927	78.7909	78.7909	82.2927	85.7946	89.2964	92.7982	96.3000 (44)
Energy content (annual)	142.8101	124.9027	128.8884	112.3680	107.8198	93.0403	86.2155	98.9335	100.1151	116.6745	127.3593	138.3040 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1377.4311 (45)
Water storage loss:	21.4215	18.7354	19.3333	16.8552	16.1730	13.9560	12.9323	14.8400	15.0173	17.5012	19.1039	20.7456 (46)
Total storage loss												
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 (56)
Combi loss	49.0734	42.7126	45.5045	42.3096	41.9355	38.8558	40.1510	41.9355	42.3096	45.5045	45.7635	49.0734 (61)
Total heat required for water heating calculated for each month												

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Solar input	191.8836	167.6152	174.3928	154.6776	149.7552	131.8961	126.3665	140.8690	142.4247	162.1789	173.1228	187.3774 (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	191.8836	167.6152	174.3928	154.6776	149.7552	131.8961	126.3665	140.8690	142.4247	162.1789	173.1228	187.3774 (64)
Heat gains from water heating, kWh/month	59.7527	52.2083	54.2315	47.9398	46.3339	40.6498	38.7044	43.3793	43.8657	50.1704	53.7879	58.2544 (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	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.2743	18.8957	15.3670	11.6338	8.6964	7.3419	7.9331	10.3118	13.8405	17.5737	20.5111	21.8656	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(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)	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(71)
Water heating gains (Table 5)	80.3128	77.6909	72.8918	66.5830	62.2768	56.4581	52.0220	58.3055	60.9246	67.4333	74.7053	78.2990	(72)
Total internal gains	358.5761	355.6228	342.1358	321.1106	300.0025	279.7986	267.2486	273.8633	285.1703	306.3955	330.4694	348.4482	(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
North	3.7400	10.6334	0.6300		0.7000	0.7700	12.1539 (74)
East	0.9000	19.6403	0.6300		0.7000	0.7700	5.4021 (76)
West	0.9000	19.6403	0.6300		0.7000	0.7700	5.4021 (80)

Solar gains	22.9581	44.3620	74.2746	114.1591	147.6122	155.1085	145.9862	119.7996	87.9348	52.7271	28.4649	19.0169 (83)
Total gains	381.5341	399.9848	416.4104	435.2696	447.6147	434.9071	413.2348	393.6629	373.1051	359.1227	358.9344	367.4651 (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	60.3566	60.5098	60.6607	61.3798	61.5162	62.1594	62.1594	62.2800	61.9101	61.5162	61.2409	60.9556	
alpha	5.0238	5.0340	5.0440	5.0920	5.1011	5.1440	5.1440	5.1520	5.1273	5.1011	5.0827	5.0637	
util living area	0.9987	0.9981	0.9964	0.9901	0.9672	0.8900	0.7523	0.7966	0.9488	0.9917	0.9978	0.9990	(86)
MIT	19.7068	19.7998	19.9967	20.2901	20.5933	20.8469	20.9551	20.9386	20.7468	20.3728	19.9973	19.6924	(87)
Th 2	19.9597	19.9621	19.9644	19.9753	19.9773	19.9868	19.9868	19.9886	19.9832	19.9773	19.9732	19.9689	(88)
util rest of house	0.9983	0.9975	0.9949	0.9856	0.9494	0.8236	0.6160	0.6710	0.9119	0.9870	0.9968	0.9986	(89)
MIT 2	18.2300	18.3676	18.6570	19.0917	19.5253	19.8621	19.9664	19.9570	19.7427	19.2148	18.6645	18.2154	(90)
Living area fraction									fLA = Living area / (4) =			0.3437	(91)
MIT	18.7376	18.8599	19.1175	19.5036	19.8924	20.2006	20.3062	20.2944	20.0878	19.6128	19.1226	18.7231	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7376	18.8599	19.1175	19.5036	19.8924	20.2006	20.3062	20.2944	20.0878	19.6128	19.1226	18.7231	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9975	0.9964	0.9933	0.9827	0.9475	0.8402	0.6633	0.7138	0.9167	0.9847	0.9957	0.9980	(94)
Ext temp.	380.5835	398.5480	413.6070	427.7492	424.1130	365.4000	274.1015	281.0131	342.0328	353.6228	357.3757	366.7147	(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	1162.8013	1121.4814	1011.1177	839.7753	647.3785	437.9883	289.8433	303.9685	470.1575	712.2079	954.3156	1158.1926	(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	581.9700	485.8112	444.5479	296.6588	166.1096	0.0000	0.0000	0.0000	0.0000	266.7873	429.7967	588.8595	(98)
Space heating per m2												3260.5410	(98)
												46.5792	(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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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													3490.9432 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	581.9700	485.8112	444.5479	296.6588	166.1096	0.0000	0.0000	0.0000	0.0000	266.7873	429.7967	588.8595	(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)	623.0942	520.1405	475.9614	317.6218	177.8475	0.0000	0.0000	0.0000	0.0000	285.6395	460.1677	630.4706	(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	191.8836	167.6152	174.3928	154.6776	149.7552	131.8961	126.3665	140.8690	142.4247	162.1789	173.1228	187.3774	(64)
Efficiency of water heater	87.6659	87.5745	87.3059	86.6643	85.3126	80.3000	80.3000	80.3000	80.3000	86.2964	87.2489	80.3000	(216)
Fuel for water heating, kWh/month	218.8805	191.3974	199.7491	178.4791	175.5372	164.2541	157.3679	175.4284	177.3658	187.9326	198.4241	213.5692	(219)
Water heating fuel used												2238.3853	(219)
Annual totals kWh/year													
Space heating fuel - main system												3490.9432	(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)												375.7110	(232)
Total delivered energy for all uses												6180.0396	(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	3490.9432	0.2160	754.0437 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2238.3853	0.2160	483.4912 (264)
Space and water heating			1237.5350 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	375.7110	0.5190	194.9940 (268)
Total CO2, kg/m2/year			1471.4540 (272)
Emissions per m2 for space and water heating			17.6791 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.7856 (272b)
Emissions per m2 for pumps and fans			0.5561 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6791 * 1.00) + 2.7856 + 0.5561, rounded to 2 d.p.			21.0200 (273)

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Property Reference	J02855 Flat 7			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 7	Prop Type Ref	As Built		
Property	Flat 7, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	88 B	DER	13.18	TER	20.47
Environmental	92 A	% DER<TER	35.61		
CO ₂ Emissions (t/year)	0.49	DFEE	39.43	TFEE	48.69
General Requirements Compliance	Pass	% DFEE<TFEE	19.02		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	f764-0001
Client					

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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 53 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.47 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.18 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.4 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	1.18 (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: 5.46 (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: 1.14 m², No overhang
Windows facing South: 1.11 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 0.86 kW

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000 (1b)	x 2.4000 (2b)	= 127.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 127.2000 (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) =	0.1572 (8)
Pressure test				Yes	
Measured/design AP50				5.4600	
Infiltration rate				0.4302	(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) =		0.3980 (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	0.5074	0.4975	0.4875	0.4378	0.4278	0.3781	0.3781	0.3681	0.3980	0.4278	0.4477	0.4676 (22b)
Effective ac	0.6287	0.6237	0.6188	0.5958	0.5915	0.5715	0.5715	0.5678	0.5792	0.5915	0.6002	0.6093 (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)			2.2500	1.2357	2.7804			(27)				
Door			1.9300	1.0000	1.9300			(26)				
Roof window (Uw = 1.30)			0.6400	1.2357	0.7909			(27a)				
External Wall 1	59.5400	4.1800	55.3600	0.1500	8.3040			(29a)				
External Roof 1	36.1900	0.6400	35.5500	0.1300	4.6215			(30)				
External Roof 2	15.8500		15.8500	0.1300	2.0605			(30)				
Total net area of external elements Aum(A, m2)			111.5800					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.4873			(33)				
Party Wall 1			32.9900	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)								6.8837 (36)				
Total fabric heat loss						(33) + (36) =		27.3709 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.3916	Feb 26.1818	Mar 25.9761	Apr 25.0100	May 24.8293	Jun 23.9879	Jul 23.9879	Aug 23.8321	Sep 24.3120	Oct 24.8293	Nov 25.1949	Dec 25.5772 (38)
Heat transfer coeff	53.7625	53.5527	53.3470	52.3810	52.2002	51.3589	51.3589	51.2030	51.6829	52.2002	52.5659	52.9481 (39)
Average = Sum(39)m / 12 =												52.3801 (39)
HLP	Jan 1.0144	Feb 1.0104	Mar 1.0065	Apr 0.9883	May 0.9849	Jun 0.9690	Jul 0.9690	Aug 0.9661	Sep 0.9751	Oct 0.9849	Nov 0.9918	Dec 0.9990 (40)
HLP (average)												0.9883 (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												1.7786 (42)
Average daily hot water use (litres/day)												76.4408 (43)
Daily hot water use	Jan 84.0849	Feb 81.0273	Mar 77.9696	Apr 74.9120	May 71.8544	Jun 68.7967	Jul 68.7967	Aug 71.8544	Sep 74.9120	Oct 77.9696	Nov 81.0273	Dec 84.0849 (44)
Energy conte	124.6955	109.0595	112.5396	98.1148	94.1434	81.2386	75.2795	86.3844	87.4161	101.8750	111.2045	120.7609 (45)
Energy content (annual)										Total = Sum(45)m =		1202.7119 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7043	16.3589	16.8809	14.7172	14.1215	12.1858	11.2919	12.9577	13.1124	15.2813	16.6807	18.1141 (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)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.4718	0.3977	0.3949	0.3307	0.3044	0.2515	0.2331	0.2793	0.2947	0.3574	0.4055	0.4569 (61)
Total heat required for water heating calculated for each month	125.1673	109.4571	112.9345	98.4455	94.4479	81.4901	75.5126	86.6637	87.7108	102.2324	111.6100	121.2179 (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	125.1673	109.4571	112.9345	98.4455	94.4479	81.4901	75.5126	86.6637	87.7108	102.2324	111.6100	121.2179 (64)
Heat gains from water heating, kWh/month	41.5792	36.3617	37.5181	32.7058	31.3788	27.0747	25.0887	28.7926	29.1395	33.9628	37.0769	40.2672 (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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6444	15.6716	12.7450	9.6488	7.2126	6.0891	6.5795	8.5523	11.4789	14.5751	17.0113	18.1347 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	55.8860	54.1097	50.4276	45.4248	42.1758	37.6038	33.7214	38.6998	40.4715	45.6489	51.4957	54.1226 (72)
Total internal gains	281.2266	279.0860	268.4238	251.6951	235.1165	219.1828	208.9510	214.2935	223.0455	239.9488	259.1251	273.1138 (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				1.1400	19.6403	0.7600	0.7000	0.7700	8.2546 (76)			
South				1.1100	46.7521	0.7600	0.7000	0.7700	19.1324 (78)			
East				0.3200	26.6072	0.6300	0.7000	1.0000	3.3793 (82)			
South				0.3200	42.0754	0.6300	0.7000	1.0000	5.3439 (82)			
Solar gains	36.1102	64.1866	93.4993	123.0195	142.6385	143.2855	137.4774	122.8839	103.8872	72.6090	43.7741	30.5460 (83)
Total gains	317.3368	343.2726	361.9230	374.7145	377.7549	362.4683	346.4284	337.1775	326.9327	312.5578	302.8993	303.6598 (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	68.4595	68.7277	68.9927	70.2651	70.5084	71.6635	71.6635	71.8816	71.2141	70.5084	70.0180	69.5125
alpha	5.5640	5.5818	5.5995	5.6843	5.7006	5.7776	5.7776	5.7921	5.7476	5.7006	5.6679	5.6342
util living area	0.9980	0.9965	0.9924	0.9788	0.9348	0.8077	0.6320	0.6697	0.8862	0.9813	0.9960	0.9985 (86)
MIT	20.1593	20.2420	20.3860	20.5865	20.7710	20.9036	20.9433	20.9397	20.8609	20.6287	20.3650	20.1505 (87)
Th 2	20.0714	20.0747	20.0779	20.0931	20.0959	20.1092	20.1092	20.1117	20.1041	20.0959	20.0902	20.0841 (88)
util rest of house	0.9974	0.9953	0.9896	0.9702	0.9061	0.7303	0.5145	0.5546	0.8287	0.9721	0.9944	0.9979 (89)
MIT 2	18.9392	19.0626	19.2749	19.5763	19.8335	20.0036	20.0363	20.0368	19.9556	19.6410	19.2550	18.9367 (90)
Living area fraction	19.4443	19.5509	19.7349	19.9945	20.2216	20.3761	20.4117	20.4105	20.3304	20.0499	19.7145	19.4391 (92)
MIT	19.2943	19.4009	19.5849	19.8445	20.0716	20.2261	20.2617	20.2605	20.1804	19.8999	19.5645	19.2891 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9966	0.9941	0.9877	0.9672	0.9052	0.7416	0.5355	0.5749	0.8344	0.9695	0.9932	0.9973 (94)
Ext temp.	316.2593	341.2529	357.4601	362.4229	341.9419	268.7966	185.5007	193.8597	272.8045	303.0112	300.8330	302.8500 (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	806.1307	776.5600	698.0382	573.2819	436.9975	288.9523	188.0620	197.6714	314.2513	485.4574	655.2091	798.9417 (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	364.4643	292.5264	253.3901	151.8185	70.7214	0.0000	0.0000	0.0000	0.0000	135.7400	255.1508	369.0922 (98)
Space heating per m2	(98) / (4) = 35.7152 (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													2098.5629 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	364.4643	292.5264	253.3901	151.8185	70.7214	0.0000	0.0000	0.0000	0.0000	135.7400	255.1508	369.0922	(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)	404.0625	324.3087	280.9203	168.3132	78.4051	0.0000	0.0000	0.0000	0.0000	150.4878	282.8723	409.1932	(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	125.1673	109.4571	112.9345	98.4455	94.4479	81.4901	75.5126	86.6637	87.7108	102.2324	111.6100	121.2179	(64)
Efficiency of water heater (217)m	86.2188	85.9716	85.4421	84.2162	81.7556	76.4000	76.4000	76.4000	76.4000	83.7047	85.5003	76.4000	(216)
Fuel for water heating, kWh/month	145.1740	127.3178	132.1767	116.8962	115.5246	106.6625	98.8385	113.4342	114.8047	122.1346	130.5376	140.3891	(219)
Water heating fuel used												1463.8903	(219)
Annual totals kWh/year													
Space heating fuel - main system												2098.5629	(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)												311.6048	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.86 * 951 * 0.80) =										-523.2190		-523.2190	(233)
Total delivered energy for all uses												3425.8390	(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	2098.5629	0.2160	453.2896 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1463.8903	0.2160	316.2003 (264)
Space and water heating			769.4899 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	311.6048	0.5190	161.7229 (268)
Energy saving/generation technologies			
PV Unit	-523.2190	0.5190	-271.5507 (269)
Total CO2, kg/year			698.5871 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1800 (273)

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

DER		13.1800	ZC1
Total Floor Area	TFA	53.0000	
Assumed number of occupants	N	1.7786	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3321	ZC2
CO2 emissions from cooking, equation (L16)		3.0507	ZC3
Total CO2 emissions		33.5628	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		33.5628	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	53.0000 (1b)	x 2.4000 (2b)	= 127.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 127.2000 (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) = 0.1572 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4072 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3767 (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	0.4803	0.4709	0.4614	0.4144	0.4049	0.3579	0.3579	0.3484	0.3767	0.4049	0.4238	0.4426 (22b)
Effective ac	0.6153	0.6109	0.6065	0.5858	0.5820	0.5640	0.5640	0.5607	0.5709	0.5820	0.5898	0.5980 (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			1.9300	1.0000	1.9300		(26)					
TER Opening Type (Uw = 1.40)			2.2500	1.3258	2.9830		(27)					
TER Room Window (Uw = 1.70)			0.6400	1.5918	1.0187		(27a)					
External Wall 1	59.5400	4.1800	55.3600	0.1800	9.9648		(29a)					
External Roof 1	36.1900	0.6400	35.5500	0.1300	4.6215		(30)					
External Roof 2	15.8500		15.8500	0.1300	2.0605		(30)					
Total net area of external elements Aum(A, m2)			111.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.5785		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2105 (36)					
Total fabric heat loss						(33) + (36) =	29.7890 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 25.8293	Feb 25.6413	Mar 25.4570	Apr 24.5915	May 24.4296	Jun 23.6757	Jul 23.6757	Aug 23.5361	Sep 23.9661	Oct 24.4296	Nov 24.7572	Dec 25.0996 (38)
Heat transfer coeff	55.6183	55.4303	55.2460	54.3805	54.2186	53.4647	53.4647	53.3251	53.7551	54.2186	54.5461	54.8886 (39)
Average = Sum(39)m / 12 =												54.3797 (39)
HLP	Jan 1.0494	Feb 1.0459	Mar 1.0424	Apr 1.0260	May 1.0230	Jun 1.0088	Jul 1.0088	Aug 1.0061	Sep 1.0142	Oct 1.0230	Nov 1.0292	Dec 1.0356 (40)
HLP (average)												1.0260 (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												1.7786 (42)
Average daily hot water use (litres/day)												76.4408 (43)
Daily hot water use	84.0849	81.0273	77.9696	74.9120	71.8544	68.7967	68.7967	71.8544	74.9120	77.9696	81.0273	84.0849 (44)
Energy conte	124.6955	109.0595	112.5396	98.1148	94.1434	81.2386	75.2795	86.3844	87.4161	101.8750	111.2045	120.7609 (45)
Energy content (annual)										Total = Sum(45)m =		1202.7119 (45)
Distribution loss (46)m = 0.15 x (45)m												
18.7043	16.3589	16.8809	14.7172	14.1215	12.1858	11.2919	12.9577	13.1124	15.2813	16.6807	18.1141	(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	(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	42.8487	37.2947	39.7325	36.9429	36.6162	33.9272	35.0581	36.6162	36.9429	39.7325	39.9587	42.8487 (61)
Solar input	167.5442	146.3542	152.2721	135.0577	130.7597	115.1658	110.3376	123.0006	124.3590	141.6075	151.1632	163.6097 (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	167.5442	146.3542	152.2721	135.0577	130.7597	115.1658	110.3376	123.0006	124.3590	141.6075	151.1632	163.6097 (64)
	52.1734	45.5860	47.3525	41.8589	40.4567	35.4936	33.7950	37.8769	38.3016	43.8066	46.9652	50.8652 (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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6444	15.6716	12.7450	9.6488	7.2126	6.0891	6.5795	8.5523	11.4789	14.5751	17.0113	18.1347	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	70.1256	67.8363	63.6459	58.1373	54.3773	49.2967	45.4233	50.9098	53.1966	58.8798	65.2294	68.3672	(72)
Total internal gains	295.4662	292.8126	281.6420	264.4076	247.3180	230.8757	220.6529	226.5035	235.7706	253.1796	272.8589	287.3584	(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				1.1400	19.6403	0.6300	0.7000	0.7700	6.8426 (76)			
South				1.1100	46.7521	0.6300	0.7000	0.7700	15.8597 (78)			
East				0.3200	26.6072	0.6300	0.7000	1.0000	3.3793 (82)			
South				0.3200	42.0754	0.6300	0.7000	1.0000	5.3439 (82)			
Solar gains	31.4256	56.0647	82.1231	108.6689	126.4671	127.2242	121.9928	108.7349	91.4647	63.5505	38.1344	26.5570 (83)
Total gains	326.8918	348.8773	363.7651	373.0765	373.7851	358.0999	342.6457	335.2384	327.2353	316.7302	310.9932	313.9153 (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	66.1753	66.3997	66.6212	67.6815	67.8837	68.8408	68.8408	69.0210	68.4690	67.8837	67.4760	67.0550	
alpha	5.4117	5.4266	5.4414	5.5121	5.5256	5.5894	5.5894	5.6014	5.5646	5.5256	5.4984	5.4703	
util living area	0.9977	0.9963	0.9925	0.9805	0.9423	0.8283	0.6578	0.6926	0.8954	0.9815	0.9956	0.9982	(86)
MIT	19.9121	20.0159	20.2047	20.4703	20.7243	20.9171	20.9821	20.9762	20.8585	20.5410	20.1873	19.8983	(87)
Th 2	20.0424	20.0453	20.0482	20.0617	20.0642	20.0760	20.0760	20.0782	20.0715	20.0642	20.0591	20.0537	(88)
util rest of house	0.9970	0.9950	0.9898	0.9725	0.9157	0.7517	0.5341	0.5727	0.8394	0.9722	0.9938	0.9976	(89)
MIT 2	18.5892	18.7427	19.0199	19.4134	19.7688	20.0132	20.0685	20.0671	19.9482	19.5190	19.0035	18.5773	(90)
Living area fraction	19.1368	19.2697	19.5103	19.8509	20.1643	20.3874	20.4467	20.4434	20.3250	19.9421	19.4935	19.1241	(92)
Temperature adjustment	19.1368	19.2697	19.5103	19.8509	20.1643	20.3874	20.4467	20.4434	20.3250	19.9421	19.4935	19.1241	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9960	0.9936	0.9877	0.9702	0.9191	0.7801	0.5859	0.6227	0.8570	0.9706	0.9924	0.9967	(94)
Ext temp.	325.5730	346.6438	359.2931	361.9641	343.5454	279.3532	200.7513	208.7497	280.4313	307.4308	308.6283	312.8941	(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	825.1982	796.5185	718.7693	595.5146	458.9223	309.4220	205.6622	215.6164	334.6266	506.5147	676.0176	819.1649	(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	371.7211	302.3158	267.4503	168.1564	85.8404	0.0000	0.0000	0.0000	0.0000	148.1184	264.5203	376.6655	(98)
												1984.7882	(98)
												37.4488	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2125.0409 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	371.7211	302.3158	267.4503	168.1564	85.8404	0.0000	0.0000	0.0000	0.0000	148.1184	264.5203	376.6655	(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)	397.9884	323.6785	286.3493	180.0389	91.9063	0.0000	0.0000	0.0000	0.0000	158.5850	283.2123	403.2821	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	167.5442	146.3542	152.2721	135.0577	130.7597	115.1658	110.3376	123.0006	124.3590	141.6075	151.1632	163.6097	(64)
Efficiency of water heater (217)m	87.0002	86.8372	86.4549	85.6041	84.0202	80.3000	80.3000	80.3000	80.3000	85.1644	86.4460	87.0831	(217)
Fuel for water heating, kWh/month	192.5791	168.5386	176.1288	157.7701	155.6288	143.4194	137.4067	153.1763	154.8680	166.2754	174.8643	187.8777	(219)
Water heating fuel used												1968.5332	(219)
Annual totals kWh/year													
Space heating fuel - main system												2125.0409	(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)												311.6048	(232)
Total delivered energy for all uses												4480.1789	(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	2125.0409	0.2160	459.0088 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1968.5332	0.2160	425.2032 (264)
Space and water heating			884.2120 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	311.6048	0.5190	161.7229 (268)
Total CO2, kg/m2/year			1084.8599 (272)
Emissions per m2 for space and water heating			16.6832 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.0514 (272b)
Emissions per m2 for pumps and fans			0.7344 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.6832 * 1.00) + 3.0514 + 0.7344, rounded to 2 d.p.			20.4700 (273)

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Property Reference	J02855 Flat 8 new			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 8	Prop Type Ref	As Built		
Property	Flat 8, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	90 B	DER	9.84	TER	17.22
Environmental	94 A	% DER<TER	42.85		
CO ₂ Emissions (t/year)	0.42	DFEE	34.76	TFEE	40.31
General Requirements Compliance	Pass	% DFEE<TFEE	13.77		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	w557-0001
Client					

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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) 9.84 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 1.29 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	m3 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) =
Measured/design AP50					Yes
Infiltration rate					6.4400
Number of sides sheltered					0.4428 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4096 (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												
Effective ac	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)
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)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 * 1.29 * 951 * 0.80) =										-784.8286			-784.8286 (233)
Total delivered energy for all uses													3650.0486 (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	-784.8286	0.5190	-407.3260	(269)
Total CO2, kg/year			678.9192	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			9.8400	(273)

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

DER			9.8400	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			29.0800	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			29.0800	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	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)

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Property Reference	J02855 Flat 9			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 9	Prop Type Ref	As Built		
Property	Flat 9, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	90 B	DER	9.54	TER	17.66
Environmental	94 A	% DER<TER	45.99		
CO ₂ Emissions (t/year)	0.37	DFEE	30.96	TFEE	37.86
General Requirements Compliance	Pass	% DFEE<TFEE	18.22		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	f764-0001
Client					

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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 65 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) 17.66 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.54 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)37.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.0 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	1.16 (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: 4.30 (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 West: 2.13 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.29 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	65.0000 (1b)	x 2.4000 (2b)	= 156.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.0000 (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) = 0.1282 (8)
Pressure test					Yes
Measured/design AP50					4.3000
Infiltration rate					0.3432 (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) =		0.3175 (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	0.4048	0.3968	0.3889	0.3492	0.3413	0.3016	0.3016	0.2937	0.3175	0.3413	0.3571	0.3730 (22b)
Effective ac	0.5819	0.5787	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5696 (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)			2.1300	1.2357	2.6321		(27)
Door			1.9300	1.0000	1.9300		(26)
External Wall 1	26.8800	4.0600	22.8200	0.1500	3.4230		(29a)
External Roof 1	64.6800		64.6800	0.1300	8.4084		(30)
Total net area of external elements Aum(A, m ²)			91.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.3935		(33)
Party Wall 1			65.6600	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)							6.0705 (36)
Total fabric heat loss						(33) + (36) =	22.4641 (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	29.9572	29.7934	29.6329	28.8790	28.7379	28.0812	28.0812	27.9596	28.3342	28.7379	29.0233	29.3216 (38)
Heat transfer coeff	52.4212	52.2575	52.0970	51.3430	51.2020	50.5453	50.5453	50.4237	50.7982	51.2020	51.4873	51.7857 (39)
Average = Sum(39)m / 12 =												51.3423 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8065	0.8040	0.8015	0.7899	0.7877	0.7776	0.7776	0.7757	0.7815	0.7877	0.7921	0.7967 (40)
HLP (average)												0.7899 (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												2.1189 (42)
Average daily hot water use (litres/day)												84.5243 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	92.9767	89.5957	86.2148	82.8338	79.4528	76.0718	76.0718	79.4528	82.8338	86.2148	89.5957	92.9767 (44)
Energy content (annual)	137.8817	120.5923	124.4404	108.4902	104.0989	89.8294	83.2402	95.5193	96.6601	112.6480	122.9642	133.5311 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1329.8958 (45)
20.6823	18.0888	18.6661	16.2735	15.6148	13.4744	12.4860	14.3279	14.4990	16.8972	18.4446	20.0297 (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	0.5769	0.4862	0.4828	0.4044	0.3722	0.3075	0.2850	0.3415	0.3603	0.4370	0.4958	0.5587 (61)
Total heat required for water heating calculated for each month	138.4586	121.0785	124.9232	108.8946	104.4711	90.1369	83.5251	95.8608	97.0204	113.0851	123.4599	134.0898 (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	138.4586	121.0785	124.9232	108.8946	104.4711	90.1369	83.5251	95.8608	97.0204	113.0851	123.4599	134.0898 (64)
Heat gains from water heating, kWh/month	45.9899	40.2185	41.4971	36.1741	34.7059	29.9452	27.7486	31.8456	32.2296	37.5647	41.0095	44.5388 (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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4902	19.9756	16.2452	12.2987	9.1934	7.7615	8.3865	10.9011	14.6315	18.5780	21.6833	23.1153	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	(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)	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	(71)
Water heating gains (Table 5)	61.8144	59.8489	55.7757	50.2418	46.6478	41.5905	37.2965	42.8032	44.7633	50.4902	56.9577	59.8639	(72)
Total internal gains	327.4470	324.8904	312.2398	292.4406	272.7158	253.9844	242.1369	248.2348	258.7723	278.7645	301.3627	317.9431	(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
West				2.1300	19.6403	0.7600	0.7000			0.7700			15.4231 (80)
Solar gains		15.4231	30.1709	49.6871	72.4657	88.8094	90.9123	86.5522	74.3470	57.7882	35.8003	19.2308	12.6832 (83)
Total gains		342.8701	355.0612	361.9269	364.9063	361.5252	344.8967	328.6891	322.5818	316.5604	314.5647	320.5935	330.6263 (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	86.1080	86.3779	86.6440	87.9163	88.1585	89.3038	89.3038	89.5192	88.8591	88.1585	87.6699	87.1649	
alpha	6.7405	6.7585	6.7763	6.8611	6.8772	6.9536	6.9536	6.9679	6.9239	6.8772	6.8447	6.8110	
util living area	0.9989	0.9983	0.9964	0.9891	0.9591	0.8446	0.6615	0.6972	0.9136	0.9889	0.9977	0.9991	(86)
MIT	20.3435	20.3966	20.5030	20.6584	20.8102	20.9234	20.9550	20.9527	20.8895	20.7035	20.5014	20.3350	(87)
Th 2	20.2477	20.2499	20.2520	20.2621	20.2640	20.2728	20.2728	20.2744	20.2694	20.2640	20.2602	20.2562	(88)
util rest of house	0.9985	0.9977	0.9951	0.9846	0.9404	0.7809	0.5601	0.5982	0.8694	0.9834	0.9968	0.9989	(89)
MIT 2	19.3528	19.4322	19.5894	19.8234	20.0386	20.1858	20.2128	20.2131	20.1468	19.8908	19.5941	19.3474	(90)
Living area fraction	19.6974	19.7677	19.9072	20.1138	20.3070	20.4424	20.4710	20.4704	20.4051	20.1735	19.9097	19.6909	(91)
MIT	19.6974	19.7677	19.9072	20.1138	20.3070	20.4424	20.4710	20.4704	20.4051	20.1735	19.9097	19.6909	(92)
Temperature adjustment	19.5474	19.6177	19.7572	19.9638	20.1570	20.2924	20.3210	20.3204	20.2551	20.0235	19.7597	-0.1500	
adjusted MIT	19.5474	19.6177	19.7572	19.9638	20.1570	20.2924	20.3210	20.3204	20.2551	20.0235	19.7597	19.5409	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9981	0.9971	0.9940	0.9823	0.9371	0.7829	0.5671	0.6048	0.8683	0.9810	0.9960	0.9985	(94)
Ext temp.	342.2173	354.0291	359.7524	358.4429	338.7781	270.0067	186.3995	195.1037	274.8796	308.5827	319.3220	330.1331	(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	799.2885	769.1078	690.6595	568.0510	433.0153	287.7222	188.0777	197.6790	312.6700	482.5010	651.8130	794.4399	(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 m ²	340.0610	278.9329	246.1949	150.9178	70.1125	0.0000	0.0000	0.0000	0.0000	129.3952	239.3935	345.4442	(98)
												1800.4519	(98)
												27.6993	(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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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													1996.0664 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	340.0610	278.9329	246.1949	150.9178	70.1125	0.0000	0.0000	0.0000	0.0000	129.3952	239.3935	345.4442	(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)	377.0077	309.2382	272.9433	167.3147	77.7300	0.0000	0.0000	0.0000	0.0000	143.4537	265.4030	382.9759	(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	138.4586	121.0785	124.9232	108.8946	104.4711	90.1369	83.5251	95.8608	97.0204	113.0851	123.4599	134.0898	(64)
Efficiency of water heater	85.7199	85.5241	85.0300	83.8519	81.4015	76.4000	76.4000	76.4000	76.4000	83.1920	84.9774	85.8632	(217)
Fuel for water heating, kWh/month	161.5245	141.5724	146.9166	129.8654	128.3406	117.9803	109.3261	125.4723	126.9901	135.9327	145.2855	156.1668	(219)
Water heating fuel used												1625.3732	(219)
Annual totals kWh/year													
Space heating fuel - main system													1996.0664 (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)													397.1836 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.29 * 951 * 0.80) =										-784.8286			-784.8286 (233)
Total delivered energy for all uses													3308.7946 (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	1996.0664	0.2160	431.1503 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1625.3732	0.2160	351.0806 (264)
Space and water heating			782.2309 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	397.1836	0.5190	206.1383 (268)
Energy saving/generation technologies			
PV Unit	-784.8286	0.5190	-407.3260 (269)
Total CO2, kg/year			619.9682 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			9.5400 (273)

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

DER			9.5400 ZC1
Total Floor Area		TFA	65.0000
Assumed number of occupants		N	2.1189
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.8984 ZC2
CO2 emissions from cooking, equation (L16)			2.6131 ZC3
Total CO2 emissions			29.0515 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			29.0515 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.0000 (1b)	x 2.4000 (2b)	= 156.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.0000 (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) =					20.0000 / (5) = 0.1282 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3782 (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) = 0.3498 (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	0.4460	0.4373	0.4286	0.3848	0.3761	0.3323	0.3323	0.3236	0.3498	0.3761	0.3936	0.4111 (22b)
	0.5995	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5524	0.5612	0.5707	0.5774	0.5845 (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			1.9300	1.0000	1.9300		(26)					
TER Opening Type (Uw = 1.40)			2.1300	1.3258	2.8239		(27)					
External Wall 1	26.8800	4.0600	22.8200	0.1800	4.1076		(29a)					
External Roof 1	64.6800		64.6800	0.1300	8.4084		(30)					
Total net area of external elements Aum(A, m2)			91.5600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 17.2699		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
								250.0000 (35)				
Total fabric heat loss								5.9892 (36)				
								(33) + (36) = 23.2591 (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	30.8611	30.6623	30.4674	29.5518	29.3805	28.5831	28.5831	28.4354	28.8903	29.3805	29.7271	30.0893 (38)
Heat transfer coeff	54.1202	53.9213	53.7264	52.8109	52.6396	51.8422	51.8422	51.6945	52.1493	52.6396	52.9861	53.3484 (39)
Average = Sum(39)m / 12 =												52.8101 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8326	0.8296	0.8266	0.8125	0.8098	0.7976	0.7976	0.7953	0.8023	0.8098	0.8152	0.8207 (40)
HLP (average)												0.8125 (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												2.1189 (42)
Average daily hot water use (litres/day)												84.5243 (43)
Daily hot water use	92.9767	89.5957	86.2148	82.8338	79.4528	76.0718	76.0718	79.4528	82.8338	86.2148	89.5957	92.9767 (44)
Energy conte	137.8817	120.5923	124.4404	108.4902	104.0989	89.8294	83.2402	95.5193	96.6601	112.6480	122.9642	133.5311 (45)
Energy content (annual)										Total = Sum(45)m =		1329.8958 (45)
Distribution loss (46)m = 0.15 x (45)m	20.6823	18.0888	18.6661	16.2735	15.6148	13.4744	12.4860	14.3279	14.4990	16.8972	18.4446	20.0297 (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	47.3799	41.2386	43.9341	40.8495	40.4883	37.5149	38.7654	40.4883	40.8495	43.9341	44.1842	47.3799 (61)

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Total heat required for water heating calculated for each month												
	185.2617	161.8308	168.3745	149.3397	144.5872	127.3443	122.0055	136.0076	137.5097	156.5821	167.1483	180.9110 (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												
	185.2617	161.8308	168.3745	149.3397	144.5872	127.3443	122.0055	136.0076	137.5097	156.5821	167.1483	180.9110 (64)
Total per year (kWh/year) = Sum (64)m =												1836.9025 (64)
Heat gains from water heating, kWh/month												
	57.6907	50.4066	52.3600	46.2854	44.7350	39.2470	37.3687	41.8822	42.3519	48.4390	51.9316	56.2441 (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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	22.4902	19.9756	16.2452	12.2987	9.1934	7.7615	8.3865	10.9011	14.6315	18.5780	21.6833	23.1153 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946 (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)												
	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567 (71)
Water heating gains (Table 5)												
	77.5412	75.0098	70.3763	64.2852	60.1276	54.5097	50.2267	56.2933	58.8220	65.1062	72.1273	75.5969 (72)
Total internal gains	343.1738	340.0512	326.8404	306.4840	286.1956	266.9036	255.0672	261.7249	272.8310	293.3804	316.5323	333.6760 (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
West		2.1300		19.6403		0.6300		0.7000		0.7700		12.7849 (80)
Solar gains	12.7849	25.0101	41.1880	60.0702	73.6183	75.3615	71.7472	61.6298	47.9034	29.6765	15.9413	10.5137 (83)
Total gains	355.9587	365.0613	368.0284	366.5543	359.8140	342.2651	326.8144	323.3547	320.7344	323.0570	332.4736	344.1897 (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	83.4049	83.7125	84.0162	85.4727	85.7508	87.0698	87.0698	87.3185	86.5570	85.7508	85.1900	84.6115	
alpha	6.5603	6.5808	6.6011	6.6982	6.7167	6.8047	6.8047	6.8212	6.7705	6.7167	6.6793	6.6408	
util living area	0.9987	0.9981	0.9963	0.9896	0.9631	0.8579	0.6785	0.7091	0.9156	0.9879	0.9973	0.9989 (86)	
MIT	20.1591	20.2270	20.3669	20.5747	20.7797	20.9411	20.9902	20.9869	20.8979	20.6484	20.3769	20.1509 (87)	
Th 2	20.2252	20.2278	20.2304	20.2425	20.2448	20.2554	20.2554	20.2574	20.2513	20.2448	20.2402	20.2354 (88)	
util rest of house													
	0.9982	0.9974	0.9949	0.9852	0.9456	0.7955	0.5738	0.6077	0.8714	0.9820	0.9962	0.9986 (89)	
MIT 2	19.0874	19.1887	19.3949	19.7062	19.9977	20.2081	20.2510	20.2509	20.1580	19.8151	19.4176	19.0833 (90)	
Living area fraction													
									fLA = Living area / (4) =				0.3478 (91)
MIT	19.4602	19.5498	19.7330	20.0083	20.2697	20.4631	20.5081	20.5069	20.4154	20.1050	19.7513	19.4547 (92)	
Temperature adjustment													
												0.0000	
adjusted MIT	19.4602	19.5498	19.7330	20.0083	20.2697	20.4631	20.5081	20.5069	20.4154	20.1050	19.7513	19.4547 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9966	0.9937	0.9835	0.9463	0.8147	0.6106	0.6433	0.8825	0.9806	0.9953	0.9981 (94)
Useful gains	355.1156	363.8361	365.7137	360.4986	340.4934	278.8430	199.5564	208.0090	283.0638	316.7805	330.9174	343.5339 (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												
	820.4740	789.9388	710.9616	586.6370	451.1052	303.9556	202.6045	212.3032	329.3437	500.3378	670.3419	813.8117 (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												
	346.2267	286.3410	256.8644	162.8197	82.2952	0.0000	0.0000	0.0000	0.0000	136.5666	244.3857	349.8867 (98)
(98) / (4) =												28.6982 (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)
Fraction of space heat from main system(s)	1.0000 (202)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1997.2013 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	346.2267	286.3410	256.8644	162.8197	82.2952	0.0000	0.0000	0.0000	0.0000	136.5666	244.3857	349.8867 (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)	370.6924	306.5750	275.0154	174.3251	88.1105	0.0000	0.0000	0.0000	0.0000	146.2169	261.6549	374.6110 (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	185.2617	161.8308	168.3745	149.3397	144.5872	127.3443	122.0055	136.0076	137.5097	156.5821	167.1483	180.9110 (64)
Efficiency of water heater (217)m	86.6031	86.4726	86.1115	85.2691	83.6916	80.3000	80.3000	80.3000	80.3000	84.7090	86.0063	86.6840 (217)
Fuel for water heating, kWh/month	213.9204	187.1469	195.5309	175.1394	172.7618	158.5857	151.9372	169.3743	171.2449	184.8471	194.3443	208.7018 (219)
Water heating fuel used												2183.5348 (219)
Annual totals kWh/year												1997.2013 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
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)												397.1836 (232)
Total delivered energy for all uses												4652.9196 (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	1997.2013	0.2160	431.3955 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2183.5348	0.2160	471.6435 (264)
Space and water heating			903.0390 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	397.1836	0.5190	206.1383 (268)
Total CO2, kg/m2/year			1148.1023 (272)
Emissions per m2 for space and water heating			13.8929 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.1714 (272b)
Emissions per m2 for pumps and fans			0.5988 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8929 * 1.00) + 3.1714 + 0.5988, rounded to 2 d.p.			17.6600 (273)

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Property Reference	J02855 Flat 10			Issued on Date	22/10/2024
Assessment Reference	J02855 Flat 10	Prop Type Ref	As Built		
Property	Flat 10, 18 Parkside Road, READING, RG30 2DB				
SAP Rating	90 B	DER	10.52	TER	18.89
Environmental	93 A	% DER<TER	44.30		
CO ₂ Emissions (t/year)	0.48	DFEE	35.62	TFEE	46.79
General Requirements Compliance	Pass	% DFEE<TFEE	23.86		
Assessor Details	Mr. Stephen Harrison, Stephen Harrison, Tel: 01489883231, info@energyreport.co.uk			Assessor ID	f764-0001
Client					

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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 71 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) 18.89 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.6 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	1.18 (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: 2.71 (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: 1.81 m², No overhang
Windows facing West: 0.90 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 2.7 m³/m²h
Photovoltaic array 1.29 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	71.0000 (1b)	x 2.4000 (2b)	= 170.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4000 (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					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) = 0.1174 (8)
Measured/design AP50					Yes
Infiltration rate					2.7100
Number of sides sheltered					0.2529 (18)
					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2339 (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												
	0.2982	0.2924	0.2865	0.2573	0.2514	0.2222	0.2222	0.2164	0.2339	0.2514	0.2631	0.2748 (22b)
Effective ac	0.5445	0.5427	0.5411	0.5331	0.5316	0.5247	0.5247	0.5234	0.5274	0.5316	0.5346	0.5378 (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)			2.7100	1.2357	3.3489			(27)				
Door			1.9300	1.0000	1.9300			(26)				
Roof window (Uw = 1.30)			0.3200	1.2357	0.3954			(27a)				
External Wall 1	61.0600	4.6400	56.4200	0.1500	8.4630			(29a)				
External Roof 1	70.6800	0.3200	70.3600	0.1300	9.1468			(30)				
Total net area of external elements Aum(A, m2)			131.7400					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	23.2841			(33)				
Party Wall 1			57.0200	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)								6.7883 (36)				
Total fabric heat loss						(33) + (36) =		30.0724 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.6167	Feb 30.5196	Mar 30.4244	Apr 29.9773	May 29.8937	Jun 29.5043	Jul 29.5043	Aug 29.4322	Sep 29.6543	Oct 29.8937	Nov 30.0629	Dec 30.2398 (38)
Heat transfer coeff	60.6890	60.5919	60.4967	60.0497	59.9660	59.5767	59.5767	59.5045	59.7266	59.9660	60.1352	60.3121 (39)
Average = Sum(39)m / 12 =												60.0493 (39)
HLP	Jan 0.8548	Feb 0.8534	Mar 0.8521	Apr 0.8458	May 0.8446	Jun 0.8391	Jul 0.8391	Aug 0.8381	Sep 0.8412	Oct 0.8446	Nov 0.8470	Dec 0.8495 (40)
HLP (average)												0.8458 (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												2.2702 (42)
Average daily hot water use (litres/day)												88.1162 (43)
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278 (44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056 (45)
Energy content (annual)										Total = Sum(45)m =		1386.4109 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808 (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												

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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	0.6270	0.5284	0.5247	0.4395	0.4045	0.3342	0.3097	0.3712	0.3916	0.4750	0.5388	0.6072 (61)
Solar input	144.3681	126.2453	130.2533	113.5400	108.9272	93.9810	87.0872	99.9497	101.1594	117.9101	128.7284	139.8128 (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	144.3681	126.2453	130.2533	113.5400	108.9272	93.9810	87.0872	99.9497	101.1594	117.9101	128.7284	139.8128 (64)
	47.9507	41.9330	43.2659	37.7158	36.1849	31.2211	28.9310	33.2026	33.6032	39.1659	42.7577	46.4377 (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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.5258	20.8954	16.9933	12.8650	9.6167	8.1189	8.7727	11.4031	15.3052	19.4335	22.6817	24.1796	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	(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)	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	(71)
Water heating gains (Table 5)	64.4498	62.4003	58.1531	52.3831	48.6356	43.3627	38.8857	44.6272	46.6711	52.6424	59.3858	62.4162	(72)
Total internal gains	347.6476	345.0391	331.6699	310.6589	289.6356	269.6807	257.0498	263.3503	274.5162	295.7284	319.7477	337.4601	(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					1.8100	10.6334	0.7600	0.7000			0.7700			7.0957 (74)
West					0.9000	19.6403	0.7600	0.7000			0.7700			6.5168 (80)
East					0.3200	26.6072	0.6300	0.7000			1.0000			3.3793 (82)
Solar gains	16.9918	33.1405	55.8416	85.7221	110.3353	115.6305	108.9596	89.8015	66.1353	39.5206	21.1324	14.0281	(83)	
Total gains	364.6394	378.1796	387.5115	396.3810	399.9708	385.3111	366.0094	353.1518	340.6515	335.2490	340.8801	351.4882	(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	81.2430	81.3732	81.5012	82.1080	82.2225	82.7599	82.7599	82.8602	82.5520	82.2225	81.9911	81.7506	
alpha	6.4162	6.4249	6.4334	6.4739	6.4815	6.5173	6.5173	6.5240	6.5035	6.4815	6.4661	6.4500	
util living area	0.9991	0.9986	0.9971	0.9909	0.9642	0.8624	0.6911	0.7363	0.9339	0.9916	0.9982	0.9993	(86)
MIT	20.2769	20.3306	20.4428	20.6074	20.7773	20.9067	20.9486	20.9439	20.8594	20.6521	20.4375	20.2630	(87)
Th 2	20.2061	20.2073	20.2084	20.2138	20.2149	20.2196	20.2196	20.2204	20.2178	20.2149	20.2128	20.2107	(88)
util rest of house	0.9988	0.9981	0.9960	0.9870	0.9470	0.7990	0.5813	0.6303	0.8951	0.9873	0.9975	0.9991	(89)
MIT 2	19.2209	19.3004	19.4653	19.7090	19.9505	20.1169	20.1540	20.1520	20.0633	19.7755	19.4614	19.2043	(90)
Living area fraction	19.5853	19.6559	19.8026	20.0190	20.2358	20.3894	20.4282	20.4253	20.3380	20.0780	19.7982	19.5696	(92)
MIT	19.4353	19.5059	19.6526	19.8690	20.0858	20.2394	20.2782	20.2753	20.1880	19.9280	19.6482	19.4196	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9976	0.9950	0.9848	0.9434	0.8009	0.5900	0.6383	0.8933	0.9852	0.9968	0.9987	(94)
Ext temp.	364.0530	377.2590	385.5604	390.3526	377.3271	308.5841	215.9593	225.4254	304.2881	330.2754	339.7805	351.0440	(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	918.5463	884.9995	795.6901	658.6849	502.8626	335.9794	219.1324	230.5956	363.6168	559.3627	754.5892	917.9284	(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	412.5431	341.2016	305.1365	193.1992	93.3984	0.0000	0.0000	0.0000	0.0000	170.4410	298.6622	421.7620	(98)
Space heating per m2												2236.3440	(98)
												31.4978	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2479.3171 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	412.5431	341.2016	305.1365	193.1992	93.3984	0.0000	0.0000	0.0000	0.0000	170.4410	298.6622	421.7620	(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)	457.3648	378.2723	338.2888	214.1898	103.5459	0.0000	0.0000	0.0000	0.0000	188.9590	331.1111	467.5853	(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	144.3681	126.2453	130.2533	113.5400	108.9272	93.9810	87.0872	99.9497	101.1594	117.9101	128.7284	139.8128	(64)
Efficiency of water heater (217)m	86.1654	86.0044	85.5757	84.5472	82.2058	76.4000	76.4000	76.4000	76.4000	83.9960	85.5459	76.4000	(216)
Fuel for water heating, kWh/month	167.5477	146.7893	152.2083	134.2919	132.5054	123.0118	113.9885	130.8242	132.4075	140.3759	150.4788	161.9736	(219)
Water heating fuel used												1686.4029	(219)
Annual totals kWh/year													
Space heating fuel - main system												2479.3171	(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)												415.4725	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.29 * 951 * 0.80) =										-784.8286		-784.8286	(233)
Total delivered energy for all uses												3871.3639	(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	2479.3171	0.2160	535.5325 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1686.4029	0.2160	364.2630 (264)
Space and water heating			899.7955 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	415.4725	0.5190	215.6302 (268)
Energy saving/generation technologies			
PV Unit	-784.8286	0.5190	-407.3260 (269)
Total CO2, kg/year			747.0247 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.5200 (273)

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

DER		10.5200	ZC1
Total Floor Area	TFA	71.0000	
Assumed number of occupants	N	2.2702	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6606	ZC2
CO2 emissions from cooking, equation (L16)		2.4434	ZC3
Total CO2 emissions		29.6241	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		29.6241	ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.0000 (1b)	x 2.4000 (2b)	= 170.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4000 (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) =					30.0000 / (5) = 0.1761 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4261 (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) = 0.3941 (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	0.5025	0.4926	0.4828	0.4335	0.4237	0.3744	0.3744	0.3645	0.3941	0.4237	0.4434	0.4631 (22b)
Effective ac	0.6262	0.6213	0.6165	0.5940	0.5897	0.5701	0.5701	0.5664	0.5777	0.5897	0.5983	0.6072 (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			1.9300	1.0000	1.9300		(26)
TER Opening Type (Uw = 1.40)			2.7100	1.3258	3.5928		(27)
TER Room Window (Uw = 1.70)			0.3200	1.5918	0.5094		(27a)
External Wall 1	61.0600	4.6400	56.4200	0.1800	10.1556		(29a)
External Roof 1	70.6800	0.3200	70.3600	0.1300	9.1468		(30)
Total net area of external elements Aum(A, m ²)			131.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.3346		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2358 (36)
Total fabric heat loss							(33) + (36) = 32.5704 (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	35.2149	34.9392	34.6690	33.3999	33.1625	32.0571	32.0571	31.8524	32.4829	33.1625	33.6428	34.1450 (38)
Heat transfer coeff	67.7853	67.5096	67.2394	65.9703	65.7328	64.6275	64.6275	64.4228	65.0532	65.7328	66.2132	66.7154 (39)
Average = Sum(39)m / 12 =												65.9692 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9547	0.9508	0.9470	0.9292	0.9258	0.9102	0.9102	0.9074	0.9162	0.9258	0.9326	0.9397 (40)
HLP (average)												0.9291 (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												2.2702 (42)
Average daily hot water use (litres/day)												88.1162 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278 (44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056 (45)
Energy content (annual)												Total = Sum(45)m = 1386.4109 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808 (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	49.3934	42.9910	45.8011	42.5855	42.2089	39.1091	40.4127	42.2089	42.5855	45.8011	46.0618	49.3934 (61)
Total heat required for water heating calculated for each month	193.1345	168.7080	175.5297	155.6860	150.7315	132.7559	127.1903	141.7874	143.3532	163.2362	174.2515	188.5990 (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	193.1345	168.7080	175.5297	155.6860	150.7315	132.7559	127.1903	141.7874	143.3532	163.2362	174.2515	188.5990 (64)
Heat gains from water heating, kWh/month	60.1423	52.5486	54.5850	48.2523	46.6360	40.9148	38.9567	43.6621	44.1517	50.4975	54.1385	58.6342 (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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.5258	20.8954	16.9933	12.8650	9.6167	8.1189	8.7727	11.4031	15.3052	19.4335	22.6817	24.1796 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508 (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)	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062 (71)
Water heating gains (Table 5)	80.8364	78.1974	73.3670	67.0171	62.6828	56.8262	52.3612	58.6856	61.3217	67.8729	75.1924	78.8094 (72)
Total internal gains	364.0341	360.8362	346.8837	325.2929	303.6827	283.1442	270.5253	277.4086	289.1669	310.9589	335.5543	353.8533 (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				1.8100	10.6334	0.6300		0.7000	0.7700		5.8820 (74)	
West				0.9000	19.6403	0.6300		0.7000	0.7700		5.4021 (80)	
East				0.3200	26.6072	0.6300		0.7000	1.0000		3.3793 (82)	
Solar gains	14.6634	28.6404	48.3090	74.1536	95.3882	99.9299	94.1801	77.6654	57.2197	34.1720	18.2452	12.0996 (83)
Total gains	378.6975	389.4766	395.1928	399.4466	399.0709	383.0740	364.7054	355.0740	346.3866	345.1309	353.7995	365.9529 (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	72.7379	73.0349	73.3284	74.7390	75.0090	76.2919	76.2919	76.5344	75.7926	75.0090	74.4648	73.9043	
alpha	5.8492	5.8690	5.8886	5.9826	6.0006	6.0861	6.0861	6.1023	6.0528	6.0006	5.9643	5.9270	
util living area	0.9989	0.9984	0.9971	0.9920	0.9717	0.8896	0.7341	0.7713	0.9433	0.9917	0.9979	0.9991 (86)	
MIT	19.9662	20.0419	20.2021	20.4460	20.6917	20.8993	20.9770	20.9689	20.8313	20.5293	20.2187	19.9613 (87)	
Th 2	20.1212	20.1245	20.1277	20.1428	20.1456	20.1588	20.1588	20.1612	20.1537	20.1456	20.1399	20.1339 (88)	
util rest of house	0.9985	0.9979	0.9960	0.9885	0.9569	0.8299	0.6160	0.6599	0.9070	0.9874	0.9971	0.9988 (89)	
MIT 2	18.7265	18.8396	19.0761	19.4426	19.7956	20.0750	20.1480	20.1450	19.9925	19.5665	19.1098	18.7287 (90)	
Living area fraction	19.1543	19.2545	19.4647	19.7889	20.1049	20.3594	20.4341	20.4293	20.2820	19.8987	19.4924	19.1540 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1543	19.2545	19.4647	19.7889	20.1049	20.3594	20.4341	20.4293	20.2820	19.8987	19.4924	19.1540 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	377.9216	388.3681	393.1358	394.0608	381.5353	324.1721	239.7057	248.0077	316.4982	340.1723	352.4631	365.3450 (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	1006.9020	969.0674	871.7357	718.3415	552.4750	372.2186	247.7851	259.5793	402.1576	611.2327	820.5432	997.6650 (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	467.9614	390.2299	356.0784	233.4821	127.1791	0.0000	0.0000	0.0000	0.0000	201.6689	337.0177	470.4461 (98)
Space heating												2584.0636 (98)
Space heating per m2												36.3953 (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													2766.6634 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.9614	390.2299	356.0784	233.4821	127.1791	0.0000	0.0000	0.0000	0.0000	201.6689	337.0177	470.4461	(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)	501.0294	417.8051	381.2402	249.9808	136.1661	0.0000	0.0000	0.0000	0.0000	215.9196	360.8327	503.6896	(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	193.1345	168.7080	175.5297	155.6860	150.7315	132.7559	127.1903	141.7874	143.3532	163.2362	174.2515	188.5990	(64)
Efficiency of water heater	87.1960	87.0935	86.7954	86.0692	84.6268	80.3000	80.3000	80.3000	80.3000	85.5845	86.6840	87.2592	(217)
Fuel for water heating, kWh/month	221.4948	193.7090	202.2340	180.8847	178.1131	165.3249	158.3939	176.5721	178.5221	190.7310	201.0191	216.1365	(219)
Water heating fuel used												2263.1351	(219)
Annual totals kWh/year													
Space heating fuel - main system												2766.6634	(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)												415.4725	(232)
Total delivered energy for all uses												5520.2710	(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	2766.6634	0.2160	597.5993 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2263.1351	0.2160	488.8372 (264)
Space and water heating			1086.4365 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	415.4725	0.5190	215.6302 (268)
Total CO2, kg/m2/year			1340.9917 (272)
Emissions per m2 for space and water heating			15.3019 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.0370 (272b)
Emissions per m2 for pumps and fans			0.5482 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3019 * 1.00) + 3.0370 + 0.5482, rounded to 2 d.p.			18.8900 (273)