

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:50

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 73.36m²

Site Reference : New Project

Plot Reference: Flat 1

Address : Flat 1, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.88 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.30 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 52.1 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (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	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls: Programmer and at least two room thermostats **OK**
Hot water controls: Cylinderstat **OK**
Independent timer for DHW **OK**
Boiler interlock: Yes **OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Medium **OK**
Based on:
Overshading: Average or unknown
Windows facing: North East 17.25m²
Windows facing: South East 2.16m²
Ventilation rate: 3.00

10 Key features

Party Walls U-value 0 W/m²K

Predicted Energy Assessment



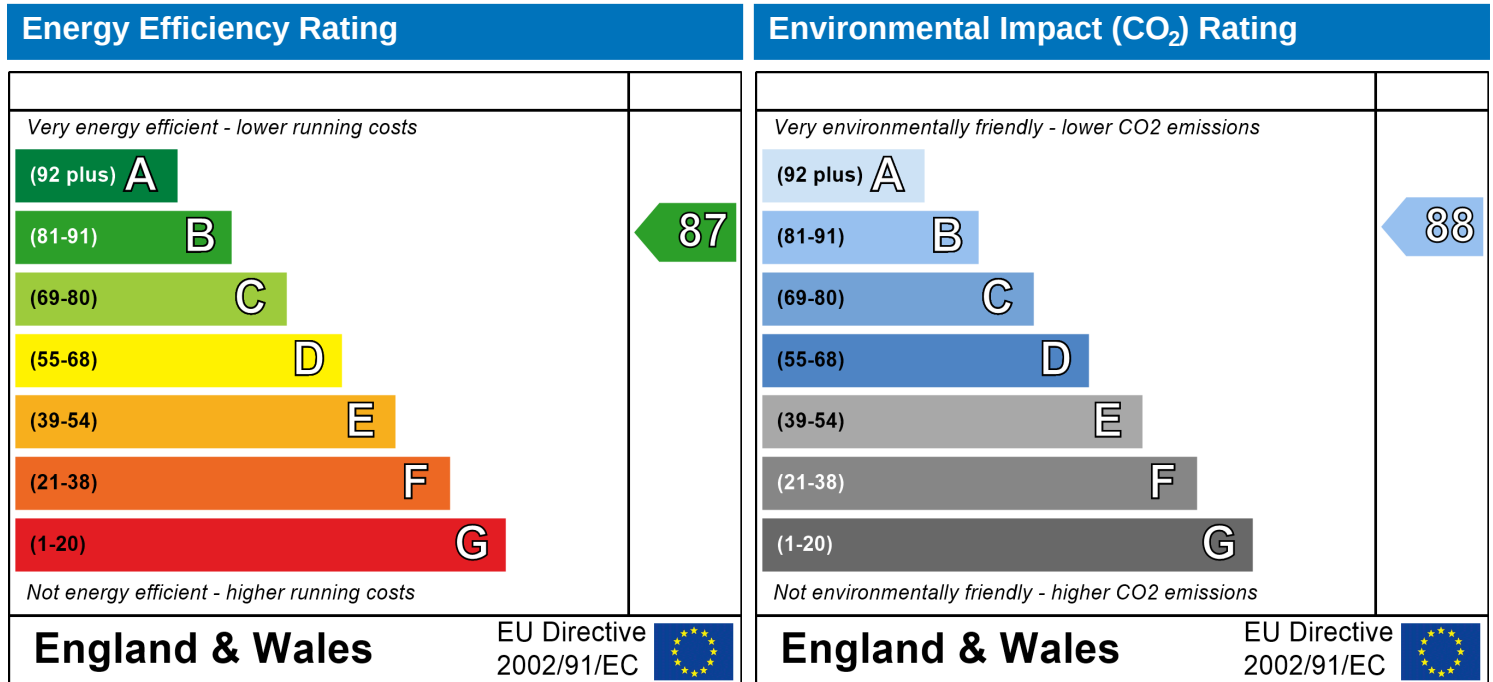
Flat 1
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Ground floor Flat
07 December 2021
Ben Joannides
73.36 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 1

Address : Flat 1, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	73.36 (1a)	2.7 (2a)	198.07 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73.36 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	198.07 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.1 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.35 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.45	0.44	0.43	0.39	0.38	0.33	0.33	0.32	0.35	0.38	0.39	0.41
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.6 0.6 0.59 0.57 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.6 0.6 0.59 0.57 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			3.45	$\times 1/[1/(1.4) + 0.04] =$	4.57		(27)
Windows Type 2			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Floor			73.36	$\times$ 0.13	= 9.536799		(28)
Walls	50.49	19.41	31.08	$\times$ 0.24	= 7.46		(29)
Total area of elements, m²			123.85				(31)
Party wall			50.49	$\times$ 0	= 0		(32)
Party ceiling			73.36				(32b)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 42.73 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 13673.65 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.22 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 52.95 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m=	39.23	38.97	38.72	37.55	37.33	36.32	36.32	36.13	36.71	37.33	37.78	38.24

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	92.17	91.92	91.67	90.5	90.28	89.26	89.26	89.07	89.65	90.28	90.72	91.19
Average = Sum(39) _{1...12} /12=												90.5

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	1.26	1.25	1.25	1.23	1.23	1.22	1.22	1.21	1.22	1.23	1.24	1.24		
Average = Sum(40) _{1...12} /12=													1.23	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.32

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

89.42

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	98.36	94.78	91.2	87.63	84.05	80.47	80.47	84.05	87.63	91.2	94.78	98.36		
Total = Sum(44) _{1..12} =													1072.98	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	145.86	127.57	131.64	114.77	110.12	95.03	88.06	101.05	102.25	119.17	130.08	141.26		
Total = Sum(45) _{1...12} =													1406.85	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.88	19.14	19.75	17.22	16.52	14.25	13.21	15.16	15.34	17.87	19.51	21.19		(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
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If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
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Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
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Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28	(62)
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Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
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Output from water heater

(64)m=	190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28	
Output from water heater (annual) _{1...12}												1936.98	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	84.52	74.95	79.79	73.02	72.64	66.45	65.3	69.62	68.86	75.64	78.11	82.99	(65)
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include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	45.69	40.58	33	24.99	18.68	15.77	17.04	22.15	29.73	37.74	44.05	46.96	(67)
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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	305.98	309.16	301.16	284.12	262.62	242.41	228.91	225.74	233.74	250.77	272.27	292.48	(68)
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	(69)
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Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
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Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	(71)
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Water heating gains (Table 5)

(72)m=	113.6	111.53	107.24	101.41	97.63	92.3	87.77	93.57	95.63	101.67	108.48	111.54	(72)
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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	563.05	559.05	539.18	508.29	476.7	448.25	431.49	439.23	456.87	487.96	522.58	548.76	(73)
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6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.45	x	11.28	x	0.63	x	0.7	=	59.48	(75)
Northeast 0.9x	0.77	x	3.45	x	22.97	x	0.63	x	0.7	=	121.08	(75)
Northeast 0.9x	0.77	x	3.45	x	41.38	x	0.63	x	0.7	=	218.14	(75)
Northeast 0.9x	0.77	x	3.45	x	67.96	x	0.63	x	0.7	=	358.25	(75)
Northeast 0.9x	0.77	x	3.45	x	91.35	x	0.63	x	0.7	=	481.56	(75)

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Northeast 0.9x	0.77	x	3.45	x	97.38	x	0.63	x	0.7	=	513.39	(75)
Northeast 0.9x	0.77	x	3.45	x	91.1	x	0.63	x	0.7	=	480.27	(75)
Northeast 0.9x	0.77	x	3.45	x	72.63	x	0.63	x	0.7	=	382.88	(75)
Northeast 0.9x	0.77	x	3.45	x	50.42	x	0.63	x	0.7	=	265.81	(75)
Northeast 0.9x	0.77	x	3.45	x	28.07	x	0.63	x	0.7	=	147.97	(75)
Northeast 0.9x	0.77	x	3.45	x	14.2	x	0.63	x	0.7	=	74.84	(75)
Northeast 0.9x	0.77	x	3.45	x	9.21	x	0.63	x	0.7	=	48.58	(75)
Southeast 0.9x	0.77	x	1.08	x	36.79	x	0.63	x	0.7	=	24.29	(77)
Southeast 0.9x	0.77	x	1.08	x	62.67	x	0.63	x	0.7	=	41.37	(77)
Southeast 0.9x	0.77	x	1.08	x	85.75	x	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	x	1.08	x	106.25	x	0.63	x	0.7	=	70.14	(77)
Southeast 0.9x	0.77	x	1.08	x	119.01	x	0.63	x	0.7	=	78.56	(77)
Southeast 0.9x	0.77	x	1.08	x	118.15	x	0.63	x	0.7	=	77.99	(77)
Southeast 0.9x	0.77	x	1.08	x	113.91	x	0.63	x	0.7	=	75.19	(77)
Southeast 0.9x	0.77	x	1.08	x	104.39	x	0.63	x	0.7	=	68.91	(77)
Southeast 0.9x	0.77	x	1.08	x	92.85	x	0.63	x	0.7	=	61.29	(77)
Southeast 0.9x	0.77	x	1.08	x	69.27	x	0.63	x	0.7	=	45.73	(77)
Southeast 0.9x	0.77	x	1.08	x	44.07	x	0.63	x	0.7	=	29.09	(77)
Southeast 0.9x	0.77	x	1.08	x	31.49	x	0.63	x	0.7	=	20.79	(77)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	83.77	162.45	274.75	428.39	560.12	591.39	555.46	451.79	327.1	193.69	103.94	69.36	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	646.82	721.5	813.93	936.69	1036.82	1039.64	986.95	891.01	783.97	681.65	626.52	618.12	(84)
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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.88	0.73	0.54	0.4	0.45	0.72	0.93	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.87	20.03	20.31	20.66	20.9	20.98	21	20.99	20.93	20.62	20.18	19.85	(87)
--------	-------	-------	-------	-------	------	-------	----	-------	-------	-------	-------	-------	------

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.88	19.88	19.88	19.89	19.9	19.91	19.91	19.91	19.9	19.9	19.89	19.89	(88)
--------	-------	-------	-------	-------	------	-------	-------	-------	------	------	-------	-------	------

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.85	0.67	0.45	0.3	0.35	0.63	0.9	0.97	0.99	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.88	19.03	19.31	19.64	19.83	19.9	19.91	19.91	19.87	19.61	19.19	18.86	(90)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.28	19.44	19.71	20.05	20.26	20.34	20.35	20.35	20.3	20.02	19.59	19.26	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	------

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.28	19.44	19.71	20.05	20.26	20.34	20.35	20.35	20.3	20.02	19.59	19.26	(93)
--------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	------

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains, h_m :

(94)m=	0.98	0.97	0.94	0.86	0.69	0.48	0.34	0.39	0.66	0.9	0.97	0.99	(94)
--------	------	------	------	------	------	------	------	------	------	-----	------	------	------

Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	636.83	702.54	768.05	801.36	713.49	503.29	333.25	349.1	519.55	616.12	609.09	610.21	(95)
--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
--------	-----	-----	-----	-----	------	------	------	------	------	------	-----	-----	------

Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times [(93)m - (96)m]]$

(97)m=	1380.72	1336.21	1211.31	1009.34	773.07	512.09	334.47	351.53	555.58	850.24	1133.18	1373.02	(97)
--------	---------	---------	---------	---------	--------	--------	--------	--------	--------	--------	---------	---------	------

Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	553.45	425.82	329.79	149.74	44.33	0	0	0	0	174.18	377.35	567.53	
--------	--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------	--

Total per year ($kWh/year$) = $Sum(98)_{1..5,9..12} =$ 2622.19 (98)

Space heating requirement in $kWh/m^2/year$

35.74 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system

0 (201)

Fraction of space heat from main system(s)

(202) = $1 - (201) =$

1 (202)

Fraction of total heating from main system 1

(204) = $(202) \times [1 - (203)] =$

1 (204)

Efficiency of main space heating system 1

254.94 (206)

Efficiency of secondary/supplementary heating system, %

0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

553.45	425.82	329.79	149.74	44.33	0	0	0	0	174.18	377.35	567.53
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

217.09	167.03	129.36	58.74	17.39	0	0	0	0	68.32	148.01	222.61
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Total ($kWh/year$) = $Sum(211)_{1..5,10..12} =$ 1028.54 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(215)m=	0	0	0	0	0	0	0	0	0	0	0	
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Total ($kWh/year$) = $Sum(215)_{1..5,10..12} =$ 0 (215)

Water heating

Output from water heater (calculated above)

190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28
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Efficiency of water heater

273.6 (216)

(217)m=	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	(217)
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Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=	69.77	61.49	64.57	57.87	56.71	50.66	48.64	53.39	53.3	60.01	63.47	68.09	
---------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	--

Total = $Sum(219a)_{1..12} =$ 707.96 (219)

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

1028.54

SAP WorkSheet: New dwelling design stage

Water heating fuel used		707.96	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0	(231)
Electricity for lighting		322.77	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2059.27	(238)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	135.66 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	93.38 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19	x 0.01 =	42.57 (250)
Additional standing charges (Table 12)				0 (251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =			271.62 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.96	(257)
SAP rating (Section 12)		86.55	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	533.81 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	367.43 (264)
Space and water heating	(261) + (262) + (263) + (264) =			901.24 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	167.52 (268)
Total CO2, kg/year			sum of (265)...(271) =	1068.76 (272)
CO2 emissions per m²			(272) ÷ (4) =	14.57 (273)
EI rating (section 14)				88 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	3157.62 (261)

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Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2173.44	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5331.06	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	990.91	(268)
'Total Primary Energy	sum of (265)...(271) =			6321.97	(272)
Primary energy kWh/m ² /year	(272) ÷ (4) =			86.18	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:48

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 63m²

Site Reference : New Project

Plot Reference: Flat 2

Address : Flat 2, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

**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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.94 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.54 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.7 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (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	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes OK

6 Controls

Space heating controls	Programmer and at least two room thermostats	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	20.7m ²	
Windows facing: South East	2.16m ²	
Ventilation rate:	4.00	

10 Key features

Party Walls U-value	0 W/m ² K
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Predicted Energy Assessment



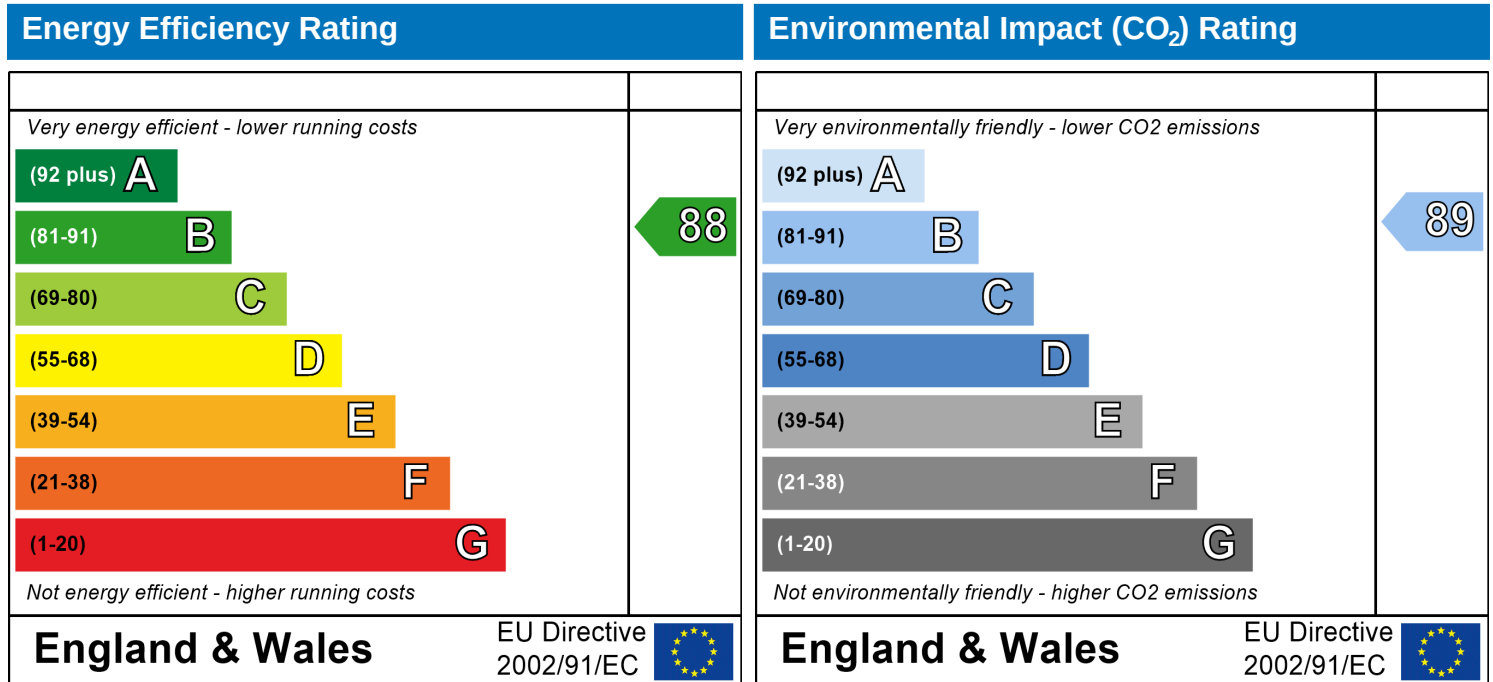
Flat 2
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Ground floor Flat
07 December 2021
Ben Joannides
63 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 2

Address : Flat 2, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	63 (1a)	2.7 (2a)	170.1 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	170.1 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.12 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.37 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.37 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43
------	------	------	-----	-----	------	------	------	------	-----	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.59 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.59 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			3.45	$\times 1/[1/(1.4) + 0.04] =$	4.57		(27)
Windows Type 2			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Floor			63	$\times$ 0.15	= 9.450001		(28)
Walls	45.5	22.86	22.64	$\times$ 0.24	= 5.43		(29)
Total area of elements, m²			108.5				(31)
Party wall			45.5	$\times$ 0	= 0		(32)
Party ceiling			63				(32b)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 45.19 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 11595.9 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.42 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 55.61 (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=	34.23	33.99	33.76	32.66	32.45	31.49	31.49	31.31	31.86	32.45	32.87	33.3

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	89.84	89.6	89.37	88.27	88.06	87.1	87.1	86.92	87.47	88.06	88.48	88.91
Average = Sum(39) _{1...12} /12=												88.27 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	1.43	1.42	1.42	1.4	1.4	1.38	1.38	1.38	1.39	1.4	1.4	1.41		
Average = Sum(40) _{1...12} /12=													1.4	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.07

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

83.25

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	91.57	88.24	84.91	81.58	78.25	74.92	74.92	78.25	81.58	84.91	88.24	91.57		
Total = Sum(44) _{1...12} =													998.94	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	135.8	118.77	122.56	106.85	102.52	88.47	81.98	94.07	95.2	110.94	121.1	131.51		
Total = Sum(45) _{1...12} =													1309.77	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.37	17.82	18.38	16.03	15.38	13.27	12.3	14.11	14.28	16.64	18.17	19.73		(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53	(62)
--------	--------	--------	--------	--------	--------	--------	-----	-------	--------	--------	--------	--------	------

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Output from water heater

(64)m=	180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53	
Output from water heater (annual) _{1...12}												1839.9	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	81.17	72.02	76.77	70.38	70.11	64.27	63.28	67.3	66.51	72.91	75.12	79.75	(65)
--------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	40.22	35.72	29.05	21.99	16.44	13.88	15	19.49	26.16	33.22	38.77	41.33	(67)
--------	-------	-------	-------	-------	-------	-------	----	-------	-------	-------	-------	-------	------

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	269.32	272.12	265.07	250.08	231.15	213.37	201.48	198.69	205.73	220.72	239.65	257.44	(68)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	(69)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	(71)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Water heating gains (Table 5)

(72)m=	109.1	107.18	103.19	97.76	94.23	89.27	85.05	90.46	92.38	97.99	104.34	107.19	(72)
--------	-------	--------	--------	-------	-------	-------	-------	-------	-------	-------	--------	--------	------

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	509.4	505.77	488.06	460.59	432.58	407.27	392.29	399.39	415.03	442.7	473.52	496.72	(73)
--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	------

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	1.08	x	36.79	x	0.63	x	0.7	=	24.29	(77)
Southeast 0.9x	0.77	x	1.08	x	62.67	x	0.63	x	0.7	=	41.37	(77)
Southeast 0.9x	0.77	x	1.08	x	85.75	x	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	x	1.08	x	106.25	x	0.63	x	0.7	=	70.14	(77)
Southeast 0.9x	0.77	x	1.08	x	119.01	x	0.63	x	0.7	=	78.56	(77)

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Southeast	0.9x	0.77	x	1.08	x	118.15	x	0.63	x	0.7	=	77.99	(77)
Southeast	0.9x	0.77	x	1.08	x	113.91	x	0.63	x	0.7	=	75.19	(77)
Southeast	0.9x	0.77	x	1.08	x	104.39	x	0.63	x	0.7	=	68.91	(77)
Southeast	0.9x	0.77	x	1.08	x	92.85	x	0.63	x	0.7	=	61.29	(77)
Southeast	0.9x	0.77	x	1.08	x	69.27	x	0.63	x	0.7	=	45.73	(77)
Southeast	0.9x	0.77	x	1.08	x	44.07	x	0.63	x	0.7	=	29.09	(77)
Southeast	0.9x	0.77	x	1.08	x	31.49	x	0.63	x	0.7	=	20.79	(77)
Southwest	0.9x	0.77	x	3.45	x	36.79		0.63	x	0.7	=	232.76	(79)
Southwest	0.9x	0.77	x	3.45	x	62.67		0.63	x	0.7	=	396.48	(79)
Southwest	0.9x	0.77	x	3.45	x	85.75		0.63	x	0.7	=	542.49	(79)
Southwest	0.9x	0.77	x	3.45	x	106.25		0.63	x	0.7	=	672.17	(79)
Southwest	0.9x	0.77	x	3.45	x	119.01		0.63	x	0.7	=	752.88	(79)
Southwest	0.9x	0.77	x	3.45	x	118.15		0.63	x	0.7	=	747.44	(79)
Southwest	0.9x	0.77	x	3.45	x	113.91		0.63	x	0.7	=	720.61	(79)
Southwest	0.9x	0.77	x	3.45	x	104.39		0.63	x	0.7	=	660.39	(79)
Southwest	0.9x	0.77	x	3.45	x	92.85		0.63	x	0.7	=	587.4	(79)
Southwest	0.9x	0.77	x	3.45	x	69.27		0.63	x	0.7	=	438.2	(79)
Southwest	0.9x	0.77	x	3.45	x	44.07		0.63	x	0.7	=	278.8	(79)
Southwest	0.9x	0.77	x	3.45	x	31.49		0.63	x	0.7	=	199.2	(79)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	257.05	437.86	599.09	742.31	831.45	825.43	795.81	729.3	648.69	483.92	307.89	219.98	(83)
--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	------

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	766.45	943.63	1087.16	1202.89	1264.03	1232.7	1188.09	1128.7	1063.72	926.62	781.41	716.7	(84)
--------	--------	--------	---------	---------	---------	--------	---------	--------	---------	--------	--------	-------	------

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.87	0.76	0.61	0.44	0.32	0.35	0.55	0.81	0.94	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.93	20.21	20.51	20.78	20.93	20.99	21	21	20.97	20.76	20.29	19.87	(87)
--------	-------	-------	-------	-------	-------	-------	----	----	-------	-------	-------	-------	------

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.74	19.75	19.75	19.76	19.77	19.78	19.78	19.78	19.77	19.77	19.76	19.75	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.84	0.71	0.54	0.36	0.23	0.26	0.46	0.75	0.92	0.97	(89)
--------	------	------	------	------	------	------	------	------	------	------	------	------	------

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.82	19.09	19.37	19.61	19.73	19.77	19.78	19.78	19.76	19.61	19.19	18.78	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.27	19.54	19.83	20.08	20.21	20.26	20.26	20.27	20.24	20.07	19.63	19.22	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=

19.27	19.54	19.83	20.08	20.21	20.26	20.26	20.27	20.24	20.07	19.63	19.22
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (93)

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains, h_m :

(94)m=

0.96	0.92	0.84	0.72	0.57	0.4	0.27	0.3	0.49	0.77	0.92	0.97
------	------	------	------	------	-----	------	-----	------	------	------	------

 (94)

Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=

734.48	864.34	918.65	870.49	715.09	487.23	318.42	334.77	523.05	710.38	720.54	692.65
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (95)

Monthly average external temperature from Table 8

(96)m=

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2
-----	-----	-----	-----	------	------	------	------	------	------	-----	-----

 (96)

Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times [(93)m - (96)m]]$

(97)m=

1344.54	1311.42	1190.89	986.72	749.2	492.76	319.19	335.98	537.18	833.85	1108.55	1335.16
---------	---------	---------	--------	-------	--------	--------	--------	--------	--------	---------	---------

 (97)

Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=

453.89	300.44	202.55	83.68	25.37	0	0	0	0	91.87	279.37	478.03
--------	--------	--------	-------	-------	---	---	---	---	-------	--------	--------

Total per year ($kWh/year$) = $Sum(98)_{1..5,9..12} =$

1915.2

 (98)

Space heating requirement in $kWh/m^2/year$

30.4

 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system

0

 (201)

Fraction of space heat from main system(s)

(202) = $1 - (201) =$

1

 (202)

Fraction of total heating from main system 1

(204) = $(202) \times [1 - (203)] =$

1

 (204)

Efficiency of main space heating system 1

251.36

 (206)

Efficiency of secondary/supplementary heating system, %

0

 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

453.89	300.44	202.55	83.68	25.37	0	0	0	0	91.87	279.37	478.03
--------	--------	--------	-------	-------	---	---	---	---	-------	--------	--------

(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

180.57	119.52	80.58	33.29	10.09	0	0	0	0	36.55	111.14	190.18
--------	--------	-------	-------	-------	---	---	---	---	-------	--------	--------

Total ($kWh/year$) = $Sum(211)_{1..5,10..12} =$

761.93

 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(215)m=

0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---

Total ($kWh/year$) = $Sum(215)_{1..5,10..12} =$

0

 (215)

Water heating

Output from water heater (calculated above)

180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53
--------	--------	--------	--------	--------	--------	-----	-------	--------	--------	--------	--------

Efficiency of water heater

273.6

 (216)

(217)m=

273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6
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 (217)

Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=

66.09	58.27	61.25	54.98	53.93	48.26	46.42	50.84	50.72	57.01	60.19	64.52
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Total = $Sum(219a)_{1..12} =$

672.48

 (219)

Annual totals

$kWh/year$

$kWh/year$

Space heating fuel used, main system 1

761.93

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Water heating fuel used		672.48	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0	(231)
Electricity for lighting		284.1	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1718.5	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	100.5 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	88.7 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19	x 0.01 =	37.47 (250)
Additional standing charges (Table 12)				0 (251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =			226.67 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.88	(257)
SAP rating (Section 12)		87.7	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	395.44 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	349.02 (264)
Space and water heating	(261) + (262) + (263) + (264) =			744.46 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	147.45 (268)
Total CO2, kg/year			sum of (265)...(271) =	891.9 (272)
CO2 emissions per m²			(272) ÷ (4) =	14.16 (273)
EI rating (section 14)				89 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	2339.11 (261)

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Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2064.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4403.62	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	872.18	(268)
'Total Primary Energy	sum of (265)...(271) =			5275.8	(272)
Primary energy kWh/m ² /year	(272) ÷ (4) =			83.74	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:45

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 73.36m²

Site Reference : New Project

Plot Reference: Flat 3

Address : Flat 3, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 22.95 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.78 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.4 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls: Programmer and at least two room thermostats **OK**
Hot water controls: Cylinderstat **OK**
Independent timer for DHW **OK**
Boiler interlock: Yes **OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Medium **OK**
Based on:
Overshading: Average or unknown
Windows facing: North East 5.4m²
Windows facing: South East 2.16m²
Ventilation rate: 2.00

10 Key features

Party Walls U-value 0 W/m²K

Predicted Energy Assessment



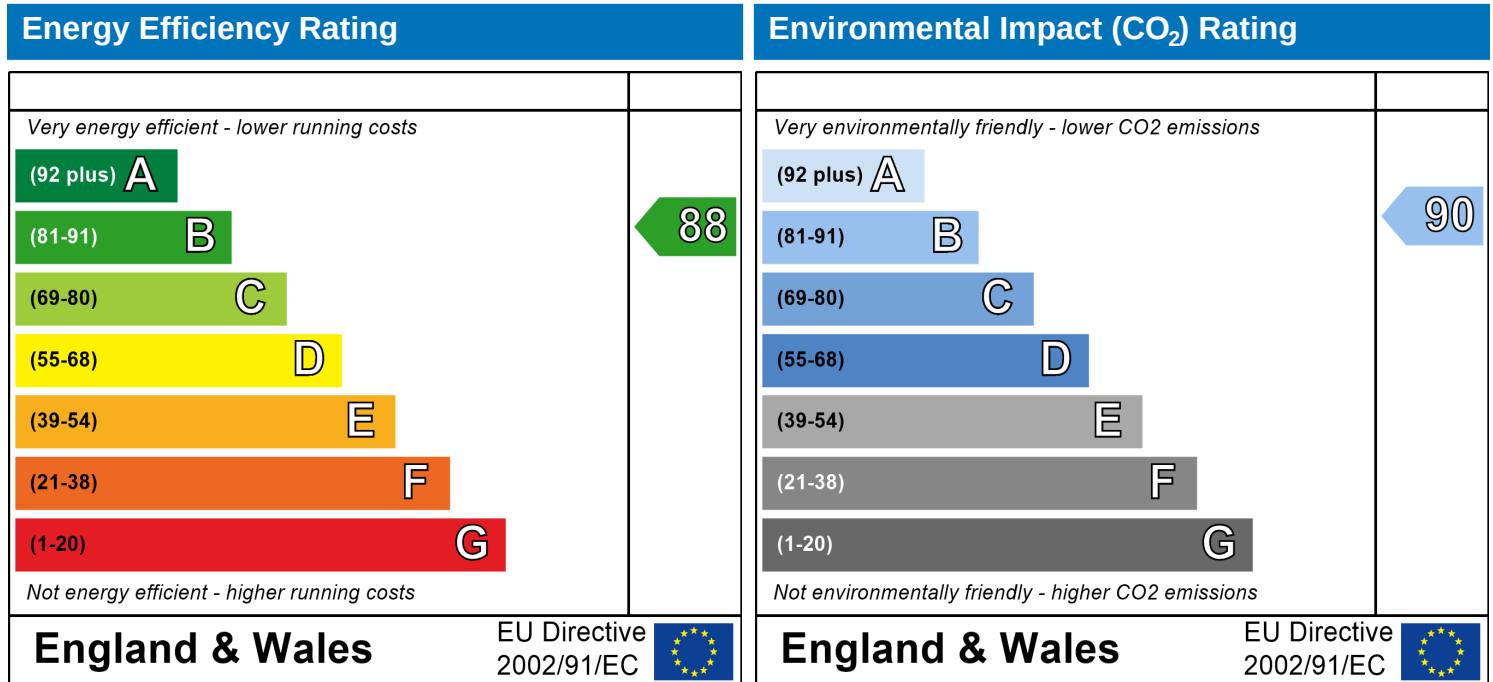
Flat 3
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Mid floor Flat
07 December 2021
Ben Joannides
73.36 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 3

Address : Flat 3, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	73.36 (1a)	x	2.7 (2a)	=	198.07 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73.36 (4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	198.07 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total		m ³ per hour
Number of chimneys	0	+	0	=	0	x 40 = 0 (6a)
Number of open flues	0	+	0	=	0	x 20 = 0 (6b)
Number of intermittent fans				2	x 10 =	20 (7a)
Number of passive vents				0	x 10 =	0 (7b)
Number of flueless gas fires				0	x 40 =	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.1 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.35 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.45	0.44	0.43	0.39	0.38	0.33	0.33	0.32	0.35	0.38	0.39	0.41
------	------	------	------	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.6 0.6 0.59 0.57 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.6 0.6 0.59 0.57 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Windows Type 2			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Walls	50.49	7.56	42.93	$\times 0.24 =$	10.3		(29)
Total area of elements, m²			50.49				(31)
Party wall			50.49	$\times 0 =$	0		(32)
Party floor			73.36				(32a)
Party ceiling			73.36				(32b)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 20.33 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 8515.85 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.66 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.98 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m=	39.23	38.97	38.72	37.55	37.33	36.32	36.32	36.13	36.71	37.33	37.78	38.24

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	65.21	64.95	64.71	63.54	63.32	62.3	62.3	62.11	62.69	63.32	63.76	64.22
Average = Sum(39) _{1...12} /12=												63.53 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	0.89	0.89	0.88	0.87	0.86	0.85	0.85	0.85	0.85	0.86	0.87	0.88		
Average = Sum(40) _{1...12} /12=													0.87	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.32

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

89.42

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	98.36	94.78	91.2	87.63	84.05	80.47	80.47	84.05	87.63	91.2	94.78	98.36		
Total = Sum(44) _{1..12} =													1072.98	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	145.86	127.57	131.64	114.77	110.12	95.03	88.06	101.05	102.25	119.17	130.08	141.26		
Total = Sum(45) _{1...12} =													1406.85	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.88	19.14	19.75	17.22	16.52	14.25	13.21	15.16	15.34	17.87	19.51	21.19		(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28	(62)
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	------

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Output from water heater

(64)m=	190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28	
Output from water heater (annual) _{1...12}												1936.98	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	84.52	74.95	79.79	73.02	72.64	66.45	65.3	69.62	68.86	75.64	78.11	82.99	(65)
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include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	52.43	46.56	37.87	28.67	21.43	18.09	19.55	25.41	34.11	43.31	50.55	53.88	(67)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	305.98	309.16	301.16	284.12	262.62	242.41	228.91	225.74	233.74	250.77	272.27	292.48	(68)
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	(69)
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Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	(71)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Water heating gains (Table 5)

(72)m=	113.6	111.53	107.24	101.41	97.63	92.3	87.77	93.57	95.63	101.67	108.48	111.54	(72)
--------	-------	--------	--------	--------	-------	------	-------	-------	-------	--------	--------	--------	------

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	569.78	565.03	544.04	511.98	479.45	450.57	434	442.49	461.25	493.52	529.08	555.68	(73)
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6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.08	x	11.28	x	0.63	x	0.7	=	18.62	(75)
Northeast 0.9x	0.77	x	1.08	x	22.97	x	0.63	x	0.7	=	37.9	(75)
Northeast 0.9x	0.77	x	1.08	x	41.38	x	0.63	x	0.7	=	68.29	(75)
Northeast 0.9x	0.77	x	1.08	x	67.96	x	0.63	x	0.7	=	112.15	(75)
Northeast 0.9x	0.77	x	1.08	x	91.35	x	0.63	x	0.7	=	150.75	(75)

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Northeast 0.9x	0.77	x	1.08	x	97.38	x	0.63	x	0.7	=	160.71	(75)
Northeast 0.9x	0.77	x	1.08	x	91.1	x	0.63	x	0.7	=	150.35	(75)
Northeast 0.9x	0.77	x	1.08	x	72.63	x	0.63	x	0.7	=	119.86	(75)
Northeast 0.9x	0.77	x	1.08	x	50.42	x	0.63	x	0.7	=	83.21	(75)
Northeast 0.9x	0.77	x	1.08	x	28.07	x	0.63	x	0.7	=	46.32	(75)
Northeast 0.9x	0.77	x	1.08	x	14.2	x	0.63	x	0.7	=	23.43	(75)
Northeast 0.9x	0.77	x	1.08	x	9.21	x	0.63	x	0.7	=	15.21	(75)
Southeast 0.9x	0.77	x	1.08	x	36.79	x	0.63	x	0.7	=	24.29	(77)
Southeast 0.9x	0.77	x	1.08	x	62.67	x	0.63	x	0.7	=	41.37	(77)
Southeast 0.9x	0.77	x	1.08	x	85.75	x	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	x	1.08	x	106.25	x	0.63	x	0.7	=	70.14	(77)
Southeast 0.9x	0.77	x	1.08	x	119.01	x	0.63	x	0.7	=	78.56	(77)
Southeast 0.9x	0.77	x	1.08	x	118.15	x	0.63	x	0.7	=	77.99	(77)
Southeast 0.9x	0.77	x	1.08	x	113.91	x	0.63	x	0.7	=	75.19	(77)
Southeast 0.9x	0.77	x	1.08	x	104.39	x	0.63	x	0.7	=	68.91	(77)
Southeast 0.9x	0.77	x	1.08	x	92.85	x	0.63	x	0.7	=	61.29	(77)
Southeast 0.9x	0.77	x	1.08	x	69.27	x	0.63	x	0.7	=	45.73	(77)
Southeast 0.9x	0.77	x	1.08	x	44.07	x	0.63	x	0.7	=	29.09	(77)
Southeast 0.9x	0.77	x	1.08	x	31.49	x	0.63	x	0.7	=	20.79	(77)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	42.91	79.27	124.9	182.29	229.31	238.71	225.54	188.77	144.5	92.04	52.52	35.99	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	612.69	644.3	668.94	694.27	708.76	689.28	659.54	631.26	605.75	585.56	581.6	591.67	(84)
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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.9	0.77	0.57	0.41	0.45	0.69	0.91	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.35	20.44	20.6	20.81	20.94	20.99	21	21	20.98	20.83	20.57	20.34	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.18	20.18	20.18	20.2	20.2	20.21	20.21	20.21	20.21	20.2	20.19	20.19	(88)
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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.98	0.95	0.88	0.72	0.5	0.34	0.37	0.62	0.88	0.97	0.99	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.6	19.69	19.85	20.05	20.16	20.21	20.21	20.21	20.2	20.07	19.82	19.59	(90)
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fLA = Living area ÷ (4) =

0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.9	19.99	20.15	20.36	20.48	20.53	20.53	20.53	20.51	20.38	20.12	19.89	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

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(93)m=	19.9	19.99	20.15	20.36	20.48	20.53	20.53	20.53	20.51	20.38	20.12	19.89	(93)
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8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains, h_m :

(94)m=	0.98	0.97	0.95	0.88	0.74	0.53	0.37	0.41	0.65	0.89	0.97	0.99	(94)
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Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	601.95	627.33	635.99	613.3	525.23	366.07	244.55	256.1	391.78	519.47	561.83	582.92	(95)
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Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times [(93)m - (96)m]]$

(97)m=	1017.38	980.47	883.5	727.84	555.91	369.15	244.81	256.55	402	619.23	830.34	1007.88	(97)
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Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	309.08	237.31	184.14	82.47	22.82	0	0	0	0	74.23	193.33	316.17	(98)
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Total per year ($kWh/year$) = $Sum(98)_{1..5,9..12} =$ 1419.55 (99)

Space heating requirement in $kWh/m^2/year$

19.35 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system

0 (201)

Fraction of space heat from main system(s)

(202) = $1 - (201) =$

1 (202)

Fraction of total heating from main system 1

(204) = $(202) \times [1 - (203)] =$

1 (204)

Efficiency of main space heating system 1

205.78 (206)

Efficiency of secondary/supplementary heating system, %

0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
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Space heating requirement (calculated above)

309.08	237.31	184.14	82.47	22.82	0	0	0	0	74.23	193.33	316.17
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(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

150.2	115.32	89.48	40.08	11.09	0	0	0	0	36.07	93.95	153.64
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Total ($kWh/year$) = $Sum(211)_{1..5,10..12} =$ 689.83 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(215)m=	0	0	0	0	0	0	0	0	0	0	0	(215)
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Total ($kWh/year$) = $Sum(215)_{1..5,10..12} =$ 0 (215)

Water heating

Output from water heater (calculated above)

190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28
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Efficiency of water heater

273.6 (216)

(217)m=	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	(217)
---------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=	69.77	61.49	64.57	57.87	56.71	50.66	48.64	53.39	53.3	60.01	63.47	68.09	(219)
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Total = $Sum(219a)_{1..12} =$ 707.96 (219)

Annual totals

$kWh/year$

$kWh/year$

Space heating fuel used, main system 1

689.83

SAP WorkSheet: New dwelling design stage

Water heating fuel used		707.96	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0	(231)
Electricity for lighting		370.35	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1768.14	(238)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	90.99 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	93.38 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19	x 0.01 =	48.85 (250)
Additional standing charges (Table 12)				0 (251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =			233.22 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.83	(257)
SAP rating (Section 12)		88.46	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	358.02 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	367.43 (264)
Space and water heating	(261) + (262) + (263) + (264) =			725.45 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	192.21 (268)
Total CO2, kg/year			sum of (265)...(271) =	917.67 (272)
CO2 emissions per m²			(272) ÷ (4) =	12.51 (273)
EI rating (section 14)				90 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	2117.79 (261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2173.44	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4291.23	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	1136.97	(268)
'Total Primary Energy	sum of (265)...(271) =			5428.19	(272)
Primary energy kWh/m ² /year	(272) ÷ (4) =			73.99	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:43

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 63m²

Site Reference : New Project

Plot Reference: Flat 4

Address : Flat 4, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 22.54 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.79 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 32.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 31.8 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls	Programmer and at least two room thermostats	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	6.48m ²	
Windows facing: South East	2.16m ²	
Ventilation rate:	3.00	

10 Key features

Party Walls U-value	0 W/m ² K
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Predicted Energy Assessment



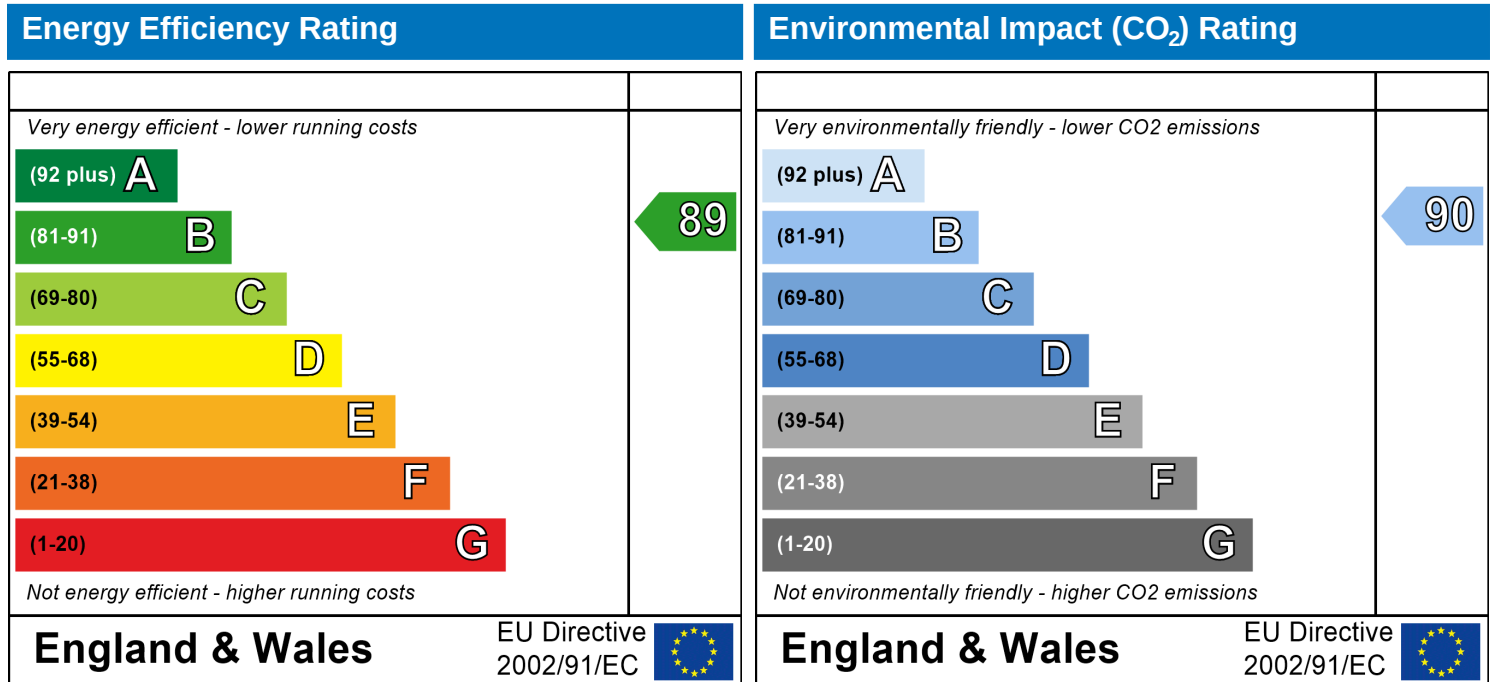
Flat 4
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Mid floor Flat
07 December 2021
Ben Joannides
63 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 4

Address : Flat 4, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	63 (1a)	2.7 (2a)	170.1 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	170.1 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.12 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.37 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.37 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43
------	------	------	-----	-----	------	------	------	------	-----	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.59 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.59 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Windows Type 2			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Walls	45.5	8.64	36.86	$\times 0.24 =$	8.85		(29)
Total area of elements, m²			45.5				(31)
Party wall			45.5	$\times 0 =$	0		(32)
Party floor			63				(32a)
Party ceiling			63				(32b)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 20.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 7409.1 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.84 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 26.14 (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=	34.23	33.99	33.76	32.66	32.45	31.49	31.49	31.31	31.86	32.45	32.87	33.3

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	60.37	60.13	59.9	58.8	58.59	57.63	57.63	57.45	58	58.59	59.01	59.44
Average = Sum(39) _{1...12} /12=												58.8

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	0.96	0.95	0.95	0.93	0.93	0.91	0.91	0.91	0.92	0.93	0.94	0.94		
Average = Sum(40) _{1...12} /12=													0.93	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.07

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

83.25

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	91.57	88.24	84.91	81.58	78.25	74.92	74.92	78.25	81.58	84.91	88.24	91.57		
Total = Sum(44) _{1...12} =													998.94	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	135.8	118.77	122.56	106.85	102.52	88.47	81.98	94.07	95.2	110.94	121.1	131.51		
Total = Sum(45) _{1...12} =													1309.77	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.37	17.82	18.38	16.03	15.38	13.27	12.3	14.11	14.28	16.64	18.17	19.73		(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
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SAP WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53	(62)
--------	--------	--------	--------	--------	--------	--------	-----	-------	--------	--------	--------	--------	------

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Output from water heater

(64)m=	180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53	
Output from water heater (annual) _{1...12}												1839.9	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	81.17	72.02	76.77	70.38	70.11	64.27	63.28	67.3	66.51	72.91	75.12	79.75	(65)
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include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	43.34	38.49	31.31	23.7	17.72	14.96	16.16	21.01	28.2	35.8	41.79	44.54	(67)
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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	269.32	272.12	265.07	250.08	231.15	213.37	201.48	198.69	205.73	220.72	239.65	257.44	(68)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	(69)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
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Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	(71)
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Water heating gains (Table 5)

(72)m=	109.1	107.18	103.19	97.76	94.23	89.27	85.05	90.46	92.38	97.99	104.34	107.19	(72)
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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	512.52	508.54	490.32	462.29	433.86	408.35	393.45	400.91	417.06	445.28	476.53	499.93	(73)
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6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	1.08	x	36.79	x	0.63	x	0.7	=	24.29	(77)
Southeast 0.9x	0.77	x	1.08	x	62.67	x	0.63	x	0.7	=	41.37	(77)
Southeast 0.9x	0.77	x	1.08	x	85.75	x	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	x	1.08	x	106.25	x	0.63	x	0.7	=	70.14	(77)
Southeast 0.9x	0.77	x	1.08	x	119.01	x	0.63	x	0.7	=	78.56	(77)

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Southeast	0.9x	0.77	x	1.08	x	118.15	x	0.63	x	0.7	=	77.99	(77)
Southeast	0.9x	0.77	x	1.08	x	113.91	x	0.63	x	0.7	=	75.19	(77)
Southeast	0.9x	0.77	x	1.08	x	104.39	x	0.63	x	0.7	=	68.91	(77)
Southeast	0.9x	0.77	x	1.08	x	92.85	x	0.63	x	0.7	=	61.29	(77)
Southeast	0.9x	0.77	x	1.08	x	69.27	x	0.63	x	0.7	=	45.73	(77)
Southeast	0.9x	0.77	x	1.08	x	44.07	x	0.63	x	0.7	=	29.09	(77)
Southeast	0.9x	0.77	x	1.08	x	31.49	x	0.63	x	0.7	=	20.79	(77)
Southwest	0.9x	0.77	x	1.08	x	36.79		0.63	x	0.7	=	72.87	(79)
Southwest	0.9x	0.77	x	1.08	x	62.67		0.63	x	0.7	=	124.12	(79)
Southwest	0.9x	0.77	x	1.08	x	85.75		0.63	x	0.7	=	169.82	(79)
Southwest	0.9x	0.77	x	1.08	x	106.25		0.63	x	0.7	=	210.42	(79)
Southwest	0.9x	0.77	x	1.08	x	119.01		0.63	x	0.7	=	235.69	(79)
Southwest	0.9x	0.77	x	1.08	x	118.15		0.63	x	0.7	=	233.98	(79)
Southwest	0.9x	0.77	x	1.08	x	113.91		0.63	x	0.7	=	225.58	(79)
Southwest	0.9x	0.77	x	1.08	x	104.39		0.63	x	0.7	=	206.73	(79)
Southwest	0.9x	0.77	x	1.08	x	92.85		0.63	x	0.7	=	183.88	(79)
Southwest	0.9x	0.77	x	1.08	x	69.27		0.63	x	0.7	=	137.18	(79)
Southwest	0.9x	0.77	x	1.08	x	44.07		0.63	x	0.7	=	87.28	(79)
Southwest	0.9x	0.77	x	1.08	x	31.49		0.63	x	0.7	=	62.36	(79)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	97.15	165.49	226.43	280.56	314.25	311.97	300.78	275.64	245.18	182.9	116.37	83.14	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	609.67	674.03	716.75	742.85	748.11	720.32	694.23	676.55	662.24	628.18	592.9	583.07	(84)
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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.84	0.69	0.51	0.36	0.39	0.59	0.84	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.37	20.5	20.68	20.86	20.96	21	21	21	20.99	20.88	20.6	20.34	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.12	20.12	20.12	20.14	20.14	20.15	20.15	20.16	20.15	20.14	20.14	20.13	(88)
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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.8	0.64	0.44	0.29	0.32	0.52	0.8	0.94	0.98	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.56	19.7	19.86	20.04	20.12	20.15	20.15	20.16	20.14	20.06	19.81	19.55	(90)
--------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.88	20.02	20.19	20.37	20.46	20.49	20.49	20.49	20.48	20.38	20.12	19.87	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.88	20.02	20.19	20.37	20.46	20.49	20.49	20.49	20.48	20.38	20.12	19.87	(93)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Utilisation factor for gains, h_m :

(94)m=	0.97	0.95	0.91	0.81	0.66	0.47	0.32	0.35	0.55	0.81	0.94	0.98	(94)
--------	------	------	------	------	------	------	------	------	------	------	------	------	------

Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	591.64	639.29	648.87	602.97	494.8	337.55	224.18	234.96	365.16	511.81	558.18	568.78	(95)
--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times [(93)m - (96)m]]$

(97)m=	940.75	909.18	820.08	674.18	513.02	339.44	224.34	235.21	370.14	573.3	768.56	931.22	(97)
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Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	259.74	181.37	127.38	51.27	13.55	0	0	0	0	45.75	151.48	269.65	(98)
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Total per year ($kWh/year$) = $Sum(98)_{1..5,9..12} =$ 1100.19

Space heating requirement in $kWh/m^2/year$

17.46 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system

0 (201)

Fraction of space heat from main system(s)

(202) = $1 - (201) =$

1 (202)

Fraction of total heating from main system 1

(204) = $(202) \times [1 - (203)] =$

1 (204)

Efficiency of main space heating system 1

195.58 (206)

Efficiency of secondary/supplementary heating system, %

0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
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Space heating requirement (calculated above)

259.74	181.37	127.38	51.27	13.55	0	0	0	0	45.75	151.48	269.65
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(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

132.8	92.73	65.13	26.21	6.93	0	0	0	0	23.39	77.45	137.87
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Total ($kWh/year$) = $Sum(211)_{1..5,10..12} =$ 562.52 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(215)m=	0	0	0	0	0	0	0	0	0	0	0	(215)
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Total ($kWh/year$) = $Sum(215)_{1..5,10..12} =$ 0

Water heating

Output from water heater (calculated above)

180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53
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Efficiency of water heater

273.6 (216)

(217)m=	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	(217)
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Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=	66.09	58.27	61.25	54.98	53.93	48.26	46.42	50.84	50.72	57.01	60.19	64.52	(219)
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Total = $Sum(219a)_{1..12} =$ 672.48

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

562.52

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Water heating fuel used		672.48	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0	(231)
Electricity for lighting		306.16	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1541.16	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	74.2 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	88.7 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19	x 0.01 =	40.38 (250)
Additional standing charges (Table 12)				0 (251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =			203.28 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.79	(257)
SAP rating (Section 12)		88.97	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	291.95 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	349.02 (264)
Space and water heating	(261) + (262) + (263) + (264) =			640.96 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	158.9 (268)
Total CO2, kg/year			sum of (265)...(271) =	799.86 (272)
CO2 emissions per m²			(272) ÷ (4) =	12.7 (273)
EI rating (section 14)				90 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	1726.93 (261)

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Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2064.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3791.44	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	939.91	(268)
'Total Primary Energy		sum of (265)...(271) =		4731.35	(272)
Primary energy kWh/m ² /year		(272) ÷ (4) =		75.1	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:40

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 73.36m²

Site Reference : New Project

Plot Reference: Flat 5

Address : Flat 5, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 22.95 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.78 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.4 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls: Programmer and at least two room thermostats **OK**
 Hot water controls: Cylinderstat **OK**
 Independent timer for DHW **OK**
 Boiler interlock: Yes **OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
 Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Medium **OK**
 Based on:
 Overshading: Average or unknown
 Windows facing: North East 5.4m²
 Windows facing: South East 2.16m²
 Ventilation rate: 2.00

10 Key features

Party Walls U-value 0 W/m²K

Predicted Energy Assessment



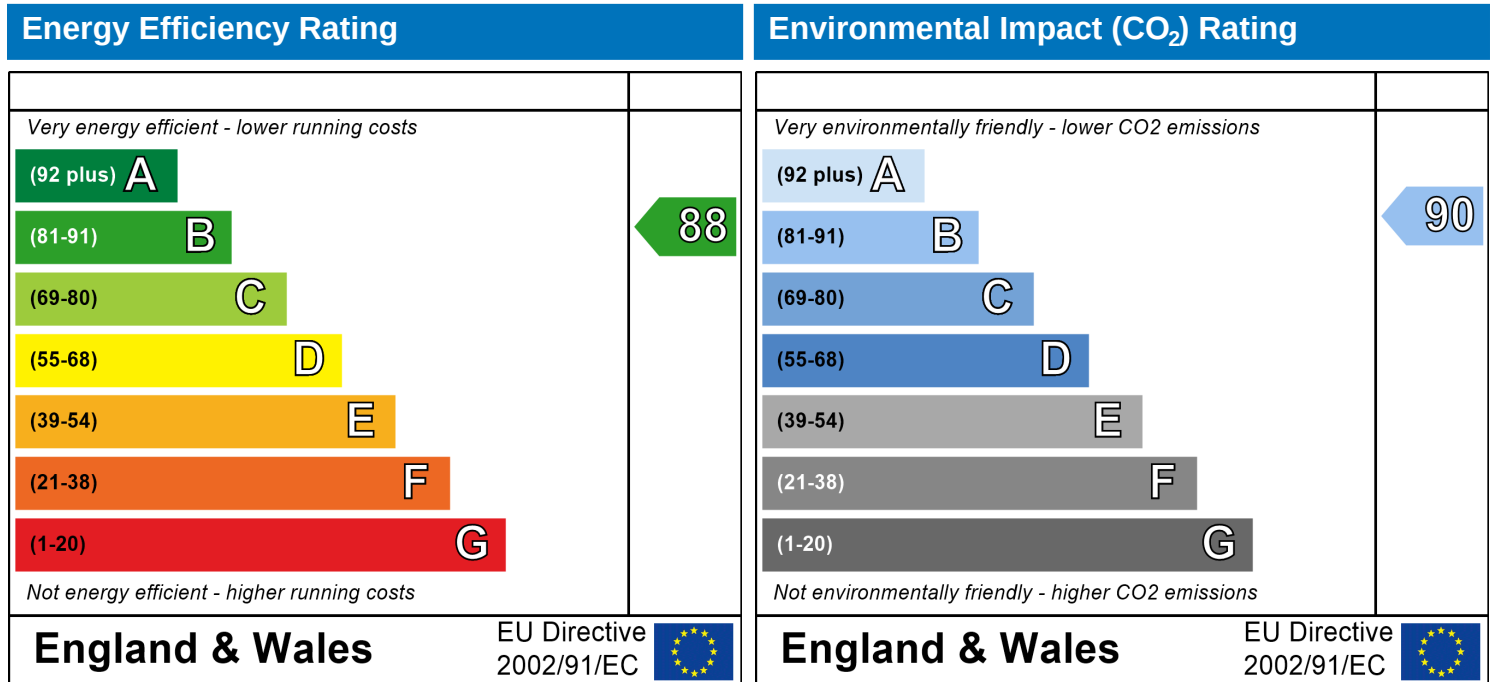
Flat 5
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Mid floor Flat
07 December 2021
Ben Joannides
73.36 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 5

Address : Flat 5, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	73.36 (1a)	2.7 (2a)	198.07 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73.36 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	198.07 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.1 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.35 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.45	0.44	0.43	0.39	0.38	0.33	0.33	0.32	0.35	0.38	0.39	0.41
------	------	------	------	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.6 0.6 0.59 0.57 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.6 0.6 0.59 0.57 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Windows Type 2			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Walls	50.49	7.56	42.93	$\times 0.24 =$	10.3		(29)
Total area of elements, m²			50.49				(31)
Party wall			50.49	$\times 0 =$	0		(32)
Party floor			73.36				(32a)
Party ceiling			73.36				(32b)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 20.33 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 8515.85 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.66 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.98 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m=	39.23	38.97	38.72	37.55	37.33	36.32	36.32	36.13	36.71	37.33	37.78	38.24

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	65.21	64.95	64.71	63.54	63.32	62.3	62.3	62.11	62.69	63.32	63.76	64.22
Average = Sum(39) _{1...12} /12=												63.53 (39)

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Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	0.89	0.89	0.88	0.87	0.86	0.85	0.85	0.85	0.85	0.86	0.87	0.88		
Average = Sum(40) _{1..12} /12=													0.87	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.32

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)²)] + 0.0013 x (TFA -13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

89.42

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	98.36	94.78	91.2	87.63	84.05	80.47	80.47	84.05	87.63	91.2	94.78	98.36		
Total = Sum(44) _{1..12} =													1072.98	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	145.86	127.57	131.64	114.77	110.12	95.03	88.06	101.05	102.25	119.17	130.08	141.26		
Total = Sum(45) _{1...12} =													1406.85	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.88	19.14	19.75	17.22	16.52	14.25	13.21	15.16	15.34	17.87	19.51	21.19		(46)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28	(62)
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	------

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Output from water heater

(64)m=	190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28	
Output from water heater (annual) _{1...12}												1936.98	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	84.52	74.95	79.79	73.02	72.64	66.45	65.3	69.62	68.86	75.64	78.11	82.99	(65)
--------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	------

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	139.49	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	52.43	46.56	37.87	28.67	21.43	18.09	19.55	25.41	34.11	43.31	50.55	53.88	(67)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	305.98	309.16	301.16	284.12	262.62	242.41	228.91	225.74	233.74	250.77	272.27	292.48	(68)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.27	(69)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	-92.99	(71)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Water heating gains (Table 5)

(72)m=	113.6	111.53	107.24	101.41	97.63	92.3	87.77	93.57	95.63	101.67	108.48	111.54	(72)
--------	-------	--------	--------	--------	-------	------	-------	-------	-------	--------	--------	--------	------

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	569.78	565.03	544.04	511.98	479.45	450.57	434	442.49	461.25	493.52	529.08	555.68	(73)
--------	--------	--------	--------	--------	--------	--------	-----	--------	--------	--------	--------	--------	------

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.08	x	11.28	x	0.63	x	0.7	=	18.62	(75)
Northeast 0.9x	0.77	x	1.08	x	22.97	x	0.63	x	0.7	=	37.9	(75)
Northeast 0.9x	0.77	x	1.08	x	41.38	x	0.63	x	0.7	=	68.29	(75)
Northeast 0.9x	0.77	x	1.08	x	67.96	x	0.63	x	0.7	=	112.15	(75)
Northeast 0.9x	0.77	x	1.08	x	91.35	x	0.63	x	0.7	=	150.75	(75)

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Northeast 0.9x	0.77	x	1.08	x	97.38	x	0.63	x	0.7	=	160.71	(75)
Northeast 0.9x	0.77	x	1.08	x	91.1	x	0.63	x	0.7	=	150.35	(75)
Northeast 0.9x	0.77	x	1.08	x	72.63	x	0.63	x	0.7	=	119.86	(75)
Northeast 0.9x	0.77	x	1.08	x	50.42	x	0.63	x	0.7	=	83.21	(75)
Northeast 0.9x	0.77	x	1.08	x	28.07	x	0.63	x	0.7	=	46.32	(75)
Northeast 0.9x	0.77	x	1.08	x	14.2	x	0.63	x	0.7	=	23.43	(75)
Northeast 0.9x	0.77	x	1.08	x	9.21	x	0.63	x	0.7	=	15.21	(75)
Southeast 0.9x	0.77	x	1.08	x	36.79	x	0.63	x	0.7	=	24.29	(77)
Southeast 0.9x	0.77	x	1.08	x	62.67	x	0.63	x	0.7	=	41.37	(77)
Southeast 0.9x	0.77	x	1.08	x	85.75	x	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	x	1.08	x	106.25	x	0.63	x	0.7	=	70.14	(77)
Southeast 0.9x	0.77	x	1.08	x	119.01	x	0.63	x	0.7	=	78.56	(77)
Southeast 0.9x	0.77	x	1.08	x	118.15	x	0.63	x	0.7	=	77.99	(77)
Southeast 0.9x	0.77	x	1.08	x	113.91	x	0.63	x	0.7	=	75.19	(77)
Southeast 0.9x	0.77	x	1.08	x	104.39	x	0.63	x	0.7	=	68.91	(77)
Southeast 0.9x	0.77	x	1.08	x	92.85	x	0.63	x	0.7	=	61.29	(77)
Southeast 0.9x	0.77	x	1.08	x	69.27	x	0.63	x	0.7	=	45.73	(77)
Southeast 0.9x	0.77	x	1.08	x	44.07	x	0.63	x	0.7	=	29.09	(77)
Southeast 0.9x	0.77	x	1.08	x	31.49	x	0.63	x	0.7	=	20.79	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ... (82)m

(83)m=	42.91	79.27	124.9	182.29	229.31	238.71	225.54	188.77	144.5	92.04	52.52	35.99	(83)
--------	-------	-------	-------	--------	--------	--------	--------	--------	-------	-------	-------	-------	------

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	612.69	644.3	668.94	694.27	708.76	689.28	659.54	631.26	605.75	585.56	581.6	591.67	(84)
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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)	21	(85)
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Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.9	0.77	0.57	0.41	0.45	0.69	0.91	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.35	20.44	20.6	20.81	20.94	20.99	21	21	20.98	20.83	20.57	20.34	(87)
--------	-------	-------	------	-------	-------	-------	----	----	-------	-------	-------	-------	------

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.18	20.18	20.18	20.2	20.2	20.21	20.21	20.21	20.21	20.2	20.19	20.19	(88)
--------	-------	-------	-------	------	------	-------	-------	-------	-------	------	-------	-------	------

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.98	0.95	0.88	0.72	0.5	0.34	0.37	0.62	0.88	0.97	0.99	(89)
--------	------	------	------	------	------	-----	------	------	------	------	------	------	------

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.6	19.69	19.85	20.05	20.16	20.21	20.21	20.21	20.2	20.07	19.82	19.59	(90)
--------	------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	------

$$fLA = \text{Living area} \div (4) = 0.4 \quad (91)$$

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

(92)m=	19.9	19.99	20.15	20.36	20.48	20.53	20.53	20.53	20.51	20.38	20.12	19.89	(92)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

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(93)m=	19.9	19.99	20.15	20.36	20.48	20.53	20.53	20.53	20.51	20.38	20.12	19.89	(93)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains, h_m :

(94)m=	0.98	0.97	0.95	0.88	0.74	0.53	0.37	0.41	0.65	0.89	0.97	0.99	(94)
--------	------	------	------	------	------	------	------	------	------	------	------	------	------

Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	601.95	627.33	635.99	613.3	525.23	366.07	244.55	256.1	391.78	519.47	561.83	582.92	(95)
--------	--------	--------	--------	-------	--------	--------	--------	-------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
--------	-----	-----	-----	-----	------	------	------	------	------	------	-----	-----	------

Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times [(93)m - (96)m]]$

(97)m=	1017.38	980.47	883.5	727.84	555.91	369.15	244.81	256.55	402	619.23	830.34	1007.88	(97)
--------	---------	--------	-------	--------	--------	--------	--------	--------	-----	--------	--------	---------	------

Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	309.08	237.31	184.14	82.47	22.82	0	0	0	0	74.23	193.33	316.17	
--------	--------	--------	--------	-------	-------	---	---	---	---	-------	--------	--------	--

Total per year ($kWh/year$) = $Sum(98)_{1..5,9..12} =$ 1419.55 (98)

Space heating requirement in $kWh/m^2/year$

19.35 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system

0 (201)

Fraction of space heat from main system(s)

(202) = $1 - (201) =$

1 (202)

Fraction of total heating from main system 1

(204) = $(202) \times [1 - (203)] =$

1 (204)

Efficiency of main space heating system 1

205.78 (206)

Efficiency of secondary/supplementary heating system, %

0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

309.08	237.31	184.14	82.47	22.82	0	0	0	0	74.23	193.33	316.17
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(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

150.2	115.32	89.48	40.08	11.09	0	0	0	0	36.07	93.95	153.64
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Total ($kWh/year$) = $Sum(211)_{1..5,10..12} =$ 689.83 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(215)m=	0	0	0	0	0	0	0	0	0	0	0		
---------	---	---	---	---	---	---	---	---	---	---	---	--	--

Total ($kWh/year$) = $Sum(215)_{1..5,10..12} =$ 0 (215)

Water heating

Output from water heater (calculated above)

190.88	168.24	176.67	158.34	155.15	138.6	133.08	146.07	145.83	164.19	173.65	186.28
--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------

Efficiency of water heater

273.6 (216)

(217)m=	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6		(217)
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Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=	69.77	61.49	64.57	57.87	56.71	50.66	48.64	53.39	53.3	60.01	63.47	68.09	
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Total = $Sum(219a)_{1..12} =$ 707.96 (219)

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

689.83

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Water heating fuel used		707.96	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0	(231)
Electricity for lighting		370.35	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1768.14	(238)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	90.99 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	93.38 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19	x 0.01 =	48.85 (250)
Additional standing charges (Table 12)				0 (251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =			233.22 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.83	(257)
SAP rating (Section 12)		88.46	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	358.02 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	367.43 (264)
Space and water heating	(261) + (262) + (263) + (264) =			725.45 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	192.21 (268)
Total CO2, kg/year			sum of (265)...(271) =	917.67 (272)
CO2 emissions per m²			(272) ÷ (4) =	12.51 (273)
EI rating (section 14)				90 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	2117.79 (261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2173.44	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4291.23	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	1136.97	(268)
'Total Primary Energy	sum of (265)...(271) =			5428.19	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			73.99	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:38

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 63m²

Site Reference : New Project

Plot Reference: Flat 6

Address : Flat 6, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

**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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 22.54 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.79 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 32.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 31.8 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls: Programmer and at least two room thermostats **OK**
Hot water controls: Cylinderstat **OK**
Independent timer for DHW **OK**
Boiler interlock: Yes **OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Medium **OK**
Based on:
Overshading: Average or unknown
Windows facing: South West 6.48m²
Windows facing: South East 2.16m²
Ventilation rate: 3.00

10 Key features

Party Walls U-value 0 W/m²K

Predicted Energy Assessment



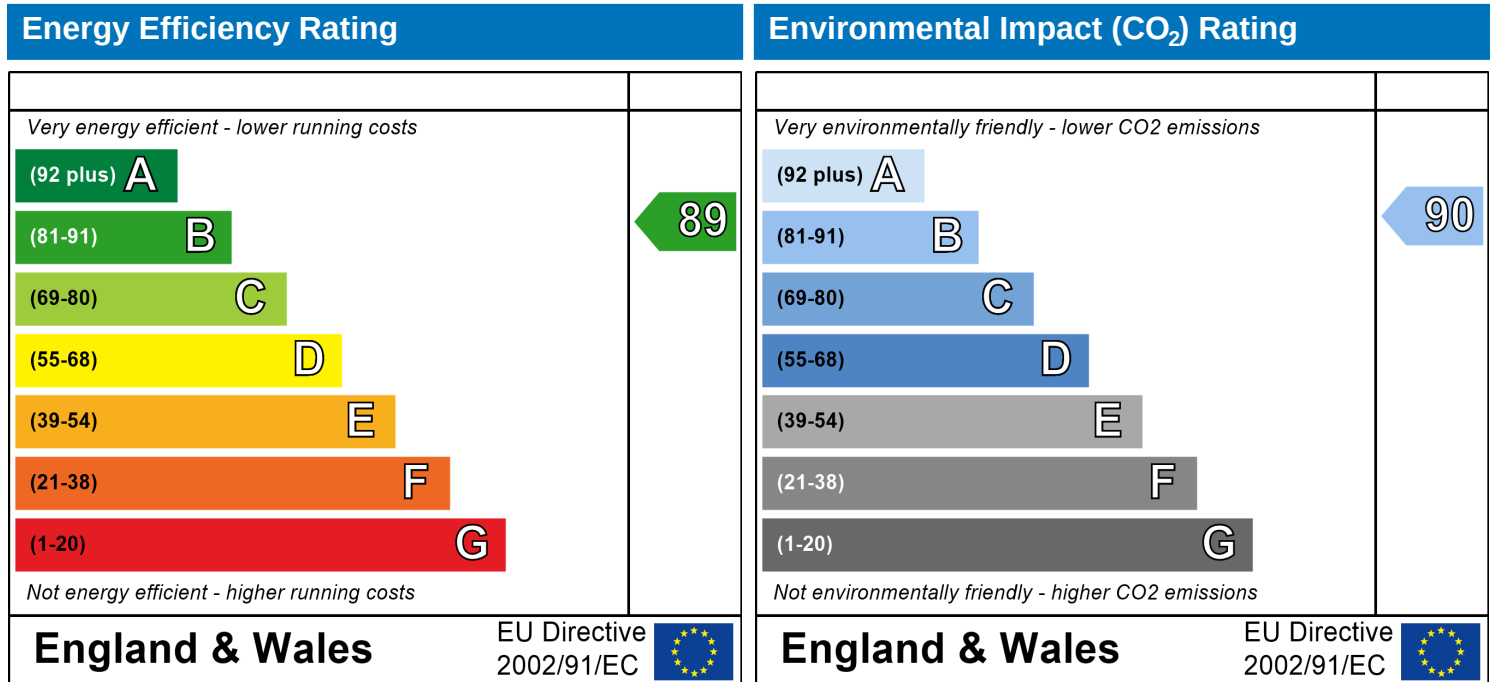
Flat 6
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Mid floor Flat
07 December 2021
Ben Joannides
63 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 6

Address : Flat 6, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	63 (1a)	2.7 (2a)	170.1 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	170.1 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.12 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.37 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.37 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43
------	------	------	-----	-----	------	------	------	------	-----	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.59 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.59 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Windows Type 2			1.08	$\times 1/[1/(1.4) + 0.04] =$	1.43		(27)
Walls	45.5	8.64	36.86	$\times 0.24 =$	8.85		(29)
Total area of elements, m²			45.5				(31)
Party wall			45.5	$\times 0 =$	0		(32)
Party floor			63				(32a)
Party ceiling			63				(32b)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 20.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 7409.1 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.84 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 26.14 (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=	34.23	33.99	33.76	32.66	32.45	31.49	31.49	31.31	31.86	32.45	32.87	33.3

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	60.37	60.13	59.9	58.8	58.59	57.63	57.63	57.45	58	58.59	59.01	59.44
Average = Sum(39) _{1...12} /12=												58.8

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	0.96	0.95	0.95	0.93	0.93	0.91	0.91	0.91	0.92	0.93	0.94	0.94		
Average = Sum(40) _{1...12} /12=													0.93	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.07

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

83.25

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	91.57	88.24	84.91	81.58	78.25	74.92	74.92	78.25	81.58	84.91	88.24	91.57		
Total = Sum(44) _{1...12} =													998.94	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	135.8	118.77	122.56	106.85	102.52	88.47	81.98	94.07	95.2	110.94	121.1	131.51		
Total = Sum(45) _{1...12} =													1309.77	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.37	17.82	18.38	16.03	15.38	13.27	12.3	14.11	14.28	16.64	18.17	19.73		(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
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SAP WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53	(62)
--------	--------	--------	--------	--------	--------	--------	-----	-------	--------	--------	--------	--------	------

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
--------	---	---	---	---	---	---	---	---	---	---	---	------

Output from water heater

(64)m=	180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53	
Output from water heater (annual) _{1...12}												1839.9	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	81.17	72.02	76.77	70.38	70.11	64.27	63.28	67.3	66.51	72.91	75.12	79.75	(65)
--------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	123.9	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	43.34	38.49	31.31	23.7	17.72	14.96	16.16	21.01	28.2	35.8	41.79	44.54	(67)
--------	-------	-------	-------	------	-------	-------	-------	-------	------	------	-------	-------	------

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	269.32	272.12	265.07	250.08	231.15	213.37	201.48	198.69	205.73	220.72	239.65	257.44	(68)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	49.46	(69)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	-82.6	(71)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Water heating gains (Table 5)

(72)m=	109.1	107.18	103.19	97.76	94.23	89.27	85.05	90.46	92.38	97.99	104.34	107.19	(72)
--------	-------	--------	--------	-------	-------	-------	-------	-------	-------	-------	--------	--------	------

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	512.52	508.54	490.32	462.29	433.86	408.35	393.45	400.91	417.06	445.28	476.53	499.93	(73)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	1.08	x	36.79	x	0.63	x	0.7	=	24.29	(77)
Southeast 0.9x	0.77	x	1.08	x	62.67	x	0.63	x	0.7	=	41.37	(77)
Southeast 0.9x	0.77	x	1.08	x	85.75	x	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	x	1.08	x	106.25	x	0.63	x	0.7	=	70.14	(77)
Southeast 0.9x	0.77	x	1.08	x	119.01	x	0.63	x	0.7	=	78.56	(77)

SAP WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	1.08	x	118.15	x	0.63	x	0.7	=	77.99	(77)
Southeast	0.9x	0.77	x	1.08	x	113.91	x	0.63	x	0.7	=	75.19	(77)
Southeast	0.9x	0.77	x	1.08	x	104.39	x	0.63	x	0.7	=	68.91	(77)
Southeast	0.9x	0.77	x	1.08	x	92.85	x	0.63	x	0.7	=	61.29	(77)
Southeast	0.9x	0.77	x	1.08	x	69.27	x	0.63	x	0.7	=	45.73	(77)
Southeast	0.9x	0.77	x	1.08	x	44.07	x	0.63	x	0.7	=	29.09	(77)
Southeast	0.9x	0.77	x	1.08	x	31.49	x	0.63	x	0.7	=	20.79	(77)
Southwest	0.9x	0.77	x	1.08	x	36.79		0.63	x	0.7	=	72.87	(79)
Southwest	0.9x	0.77	x	1.08	x	62.67		0.63	x	0.7	=	124.12	(79)
Southwest	0.9x	0.77	x	1.08	x	85.75		0.63	x	0.7	=	169.82	(79)
Southwest	0.9x	0.77	x	1.08	x	106.25		0.63	x	0.7	=	210.42	(79)
Southwest	0.9x	0.77	x	1.08	x	119.01		0.63	x	0.7	=	235.69	(79)
Southwest	0.9x	0.77	x	1.08	x	118.15		0.63	x	0.7	=	233.98	(79)
Southwest	0.9x	0.77	x	1.08	x	113.91		0.63	x	0.7	=	225.58	(79)
Southwest	0.9x	0.77	x	1.08	x	104.39		0.63	x	0.7	=	206.73	(79)
Southwest	0.9x	0.77	x	1.08	x	92.85		0.63	x	0.7	=	183.88	(79)
Southwest	0.9x	0.77	x	1.08	x	69.27		0.63	x	0.7	=	137.18	(79)
Southwest	0.9x	0.77	x	1.08	x	44.07		0.63	x	0.7	=	87.28	(79)
Southwest	0.9x	0.77	x	1.08	x	31.49		0.63	x	0.7	=	62.36	(79)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	97.15	165.49	226.43	280.56	314.25	311.97	300.78	275.64	245.18	182.9	116.37	83.14	(83)
--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	-------	------

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	609.67	674.03	716.75	742.85	748.11	720.32	694.23	676.55	662.24	628.18	592.9	583.07	(84)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	------

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.84	0.69	0.51	0.36	0.39	0.59	0.84	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.37	20.5	20.68	20.86	20.96	21	21	21	20.99	20.88	20.6	20.34	(87)
--------	-------	------	-------	-------	-------	----	----	----	-------	-------	------	-------	------

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.12	20.12	20.12	20.14	20.14	20.15	20.15	20.16	20.15	20.14	20.14	20.13	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.8	0.64	0.44	0.29	0.32	0.52	0.8	0.94	0.98	(89)
--------	------	------	-----	-----	------	------	------	------	------	-----	------	------	------

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.56	19.7	19.86	20.04	20.12	20.15	20.15	20.16	20.14	20.06	19.81	19.55	(90)
--------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.88	20.02	20.19	20.37	20.46	20.49	20.49	20.49	20.48	20.38	20.12	19.87	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.88	20.02	20.19	20.37	20.46	20.49	20.49	20.49	20.48	20.38	20.12	19.87	(93)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains, h_m :

(94)m=	0.97	0.95	0.91	0.81	0.66	0.47	0.32	0.35	0.55	0.81	0.94	0.98	(94)
--------	------	------	------	------	------	------	------	------	------	------	------	------	------

Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	591.64	639.29	648.87	602.97	494.8	337.55	224.18	234.96	365.16	511.81	558.18	568.78	(95)
--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
--------	-----	-----	-----	-----	------	------	------	------	------	------	-----	-----	------

Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times [(93)m - (96)m]]$

(97)m=	940.75	909.18	820.08	674.18	513.02	339.44	224.34	235.21	370.14	573.3	768.56	931.22	(97)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	------

Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	259.74	181.37	127.38	51.27	13.55	0	0	0	0	45.75	151.48	269.65	
Total per year ($kWh/year$) = $Sum(98)_{1..5,9..12} =$												1100.19	(98)

Space heating requirement in $kWh/m^2/year$

17.46	(99)
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9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204)

Efficiency of main space heating system 1 195.58 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	$kWh/year$
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------------

Space heating requirement (calculated above)

259.74	181.37	127.38	51.27	13.55	0	0	0	0	45.75	151.48	269.65
--------	--------	--------	-------	-------	---	---	---	---	-------	--------	--------

(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

132.8	92.73	65.13	26.21	6.93	0	0	0	0	23.39	77.45	137.87
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Total ($kWh/year$) = $Sum(211)_{1..5,10..12} =$ 562.52 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(215)m=	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215) _{1...5,10...12} =												0	(215)

Water heating

Output from water heater (calculated above)

180.82	159.43	167.58	150.42	147.55	132.04	127	139.1	138.77	155.97	164.68	176.53
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Efficiency of water heater 273.6 (216)

(217)m= 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 (217)

Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=	66.09	58.27	61.25	54.98	53.93	48.26	46.42	50.84	50.72	57.01	60.19	64.52	
Total = $Sum(219a)_{1..12} =$												672.48	(219)

Annual totals

Space heating fuel used, main system 1

$kWh/year$	$kWh/year$
	562.52

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Water heating fuel used		672.48	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0	(231)
Electricity for lighting		306.16	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1541.16	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	74.2 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	88.7 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19	x 0.01 =	40.38 (250)
Additional standing charges (Table 12)				0 (251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =			203.28 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.79	(257)
SAP rating (Section 12)		88.97	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	291.95 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	349.02 (264)
Space and water heating	(261) + (262) + (263) + (264) =			640.96 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	158.9 (268)
Total CO2, kg/year			sum of (265)...(271) =	799.86 (272)
CO2 emissions per m²			(272) ÷ (4) =	12.7 (273)
EI rating (section 14)				90 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	1726.93 (261)

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Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2064.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3791.44	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	939.91	(268)
'Total Primary Energy	sum of (265)...(271) =			4731.35	(272)
Primary energy kWh/m ² /year	(272) ÷ (4) =			75.1	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:36

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 97.13m²

Site Reference : New Project

Plot Reference: Flat 7

Address : Flat 7, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

**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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.51 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.12 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 52.8 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls: Programmer and at least two room thermostats **OK**
Hot water controls: Cylinderstat **OK**
Independent timer for DHW **OK**
Boiler interlock: Yes **OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Slight **OK**
Based on:
Overshading: Average or unknown
Windows facing: South West 7.98m²
Windows facing: South West 6.93m²
Windows facing: North East 4.95m²
Ventilation rate: 3.00

10 Key features

Party Walls U-value 0 W/m²K

Predicted Energy Assessment



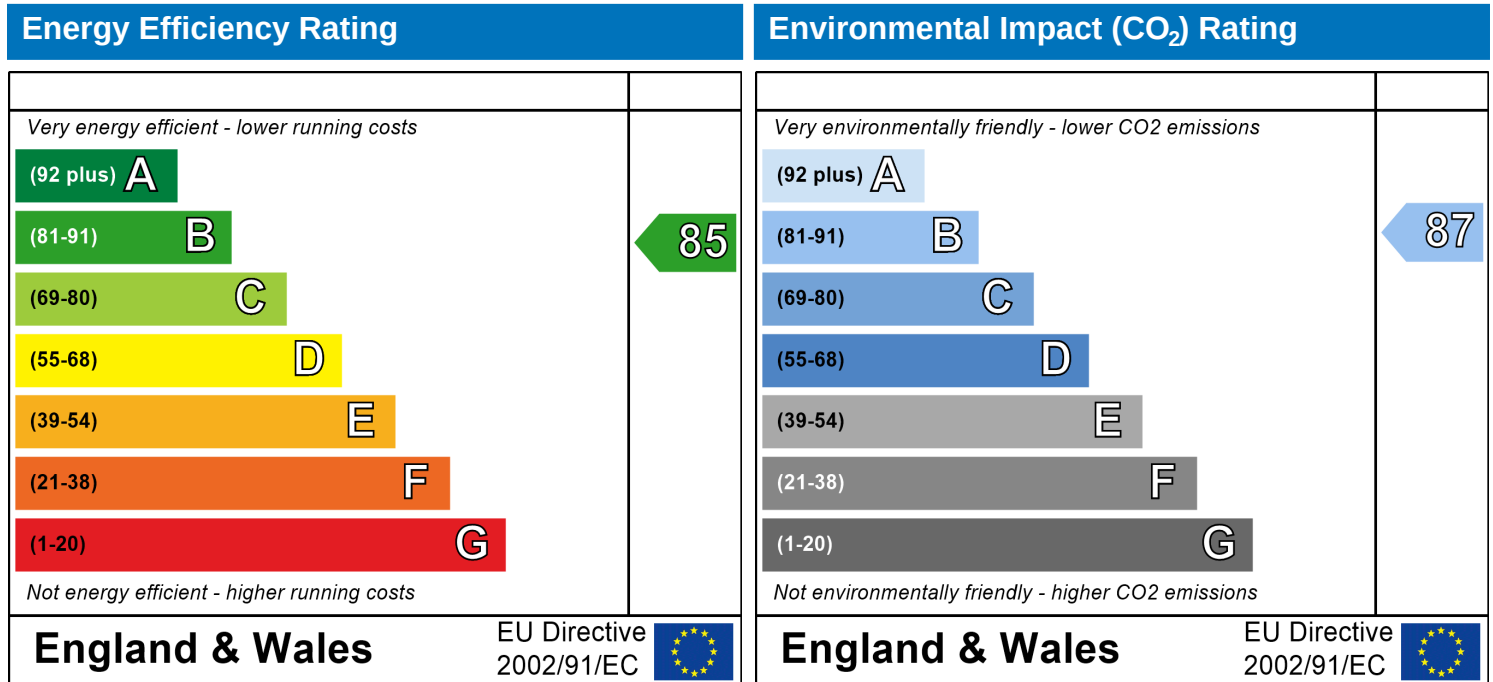
Flat 7
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Top floor Flat
07 December 2021
Ben Joannides
97.13 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 7

Address : Flat 7, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	97.13 (1a)	3 (2a)	291.39 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	97.13 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	291.39 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.07 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.32 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.32 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
--------	-----	---	-----	-----	-----	-----	-----	-----	---	-----	-----	-----

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
---------	------	------	------	-----	------	------	------	------	---	------	------	------

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37
------	-----	------	------	------	-----	-----	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.58 0.58 0.58 0.56 0.56 0.55 0.55 0.54 0.55 0.56 0.56 0.57 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.58 0.58 0.58 0.56 0.56 0.55 0.55 0.54 0.55 0.56 0.56 0.57 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			7.98	$\times 1/[1/(1.4) + 0.04] =$	10.58		(27)
Windows Type 2			6.93	$\times 1/[1/(1.4) + 0.04] =$	9.19		(27)
Windows Type 3			1.65	$\times 1/[1/(1.4) + 0.04] =$	2.19		(27)
Walls Type1	26.96	0	26.96	$\times 0.24 =$	6.47		(29)
Walls Type2	33.08	19.86	13.22	$\times 0.24 =$	3.17		(29)
Walls Type3	34.32	0	34.32	$\times 0.24 =$	8.24		(29)
Roof Type1	23.28	0	23.28	$\times 0.16 =$	3.72		(30)
Roof Type2	80.07	0	80.07	$\times 0.16 =$	12.81		(30)
Total area of elements, m²			197.71				(31)
Party wall			23.83	$\times 0 =$	0		(32)
Party floor			97.13				(32a)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 60.75 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 6261.12 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.44 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 72.18 (37)

SAP WorkSheet: New dwelling design stage

Ventilation heat loss calculated monthly

$$(38)m = 0.33 \times (25)m \times (5)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	56.01	55.71	55.4	53.99	53.72	52.48	52.48	52.26	52.96	53.72	54.26	54.82	(38)

Heat transfer coefficient, W/K

$$(39)m = (37) + (38)m$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(39)m=	128.2	127.89	127.59	126.17	125.9	124.67	124.67	124.44	125.14	125.9	126.44	127	
Average = Sum(39) _{1...12} /12=												126.17	(39)

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(40)m=	1.32	1.32	1.31	1.3	1.3	1.28	1.28	1.28	1.29	1.3	1.3	1.31	
Average = Sum(40) _{1...12} /12=												1.3	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

$$\text{if TFA} > 13.9, N = 1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)^2)] + 0.0013 \times (TFA - 13.9)$$

$$\text{if TFA} \leq 13.9, N = 1$$

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	108.45	104.51	100.57	96.62	92.68	88.73	88.73	92.68	96.62	100.57	104.51	108.45	
Total = Sum(44) _{1...12} =												1183.13	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(45)m=	160.83	140.67	145.15	126.55	121.43	104.78	97.1	111.42	112.75	131.4	143.43	155.76	
Total = Sum(45) _{1...12} =												1551.27	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	24.12	21.1	21.77	18.98	18.21	15.72	14.56	16.71	16.91	19.71	21.51	23.36	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

Temperature factor from Table 2b

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

If community heating see section 4.3

Volume factor from Table 2a

Temperature factor from Table 2b

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

Enter (50) or (54) in (55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76	(56)

SAP WorkSheet: New dwelling design stage

If cylinder contains dedicated solar storage, (57)m = (56)m × [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76	(57)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Primary circuit loss (annual) from Table 3	0	(58)
--	---	------

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	205.86	181.33	190.18	170.12	166.45	148.35	142.12	156.44	156.32	176.42	187	200.78	(62)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-----	--------	------

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

Output from water heater

(64)m=	205.86	181.33	190.18	170.12	166.45	148.35	142.12	156.44	156.32	176.42	187	200.78	
Output from water heater (annual) _{1...12}												2081.39	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	89.5	79.31	84.28	76.94	76.39	69.7	68.3	73.07	72.35	79.71	82.55	87.81	(65)
--------	------	-------	-------	-------	-------	------	------	-------	-------	-------	-------	-------	------

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	162.68	162.68	162.68	162.68	162.68	162.68	162.68	162.68	162.68	162.68	162.68	162.68	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	56.35	50.05	40.7	30.82	23.03	19.45	21.01	27.31	36.66	46.55	54.33	57.92	(67)
--------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	375.53	379.42	369.6	348.7	322.31	297.51	280.94	277.04	286.86	307.77	334.16	358.96	(68)
--------	--------	--------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	------

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	(69)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-108.45	-108.45	-108.45	-108.45	-108.45	-108.45	-108.45	-108.45	-108.45	-108.45	-108.45	-108.45	(71)
--------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	------

Water heating gains (Table 5)

(72)m=	120.29	118.01	113.28	106.85	102.68	96.8	91.81	98.21	100.48	107.14	114.65	118.02	(72)
--------	--------	--------	--------	--------	--------	------	-------	-------	--------	--------	--------	--------	------

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	660.37	655.69	631.8	594.57	556.23	521.96	501.96	510.77	532.21	569.66	611.34	643.1	(73)
--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	-------	------

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m ²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)
--------------	---------------------------	------------------------	------------------	----------------	----------------	--------------

SAP WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	1.65	x	11.28	x	0.63	x	0.7	=	17.07	(75)
Northeast	0.9x	0.77	x	1.65	x	22.97	x	0.63	x	0.7	=	34.74	(75)
Northeast	0.9x	0.77	x	1.65	x	41.38	x	0.63	x	0.7	=	62.6	(75)
Northeast	0.9x	0.77	x	1.65	x	67.96	x	0.63	x	0.7	=	102.8	(75)
Northeast	0.9x	0.77	x	1.65	x	91.35	x	0.63	x	0.7	=	138.19	(75)
Northeast	0.9x	0.77	x	1.65	x	97.38	x	0.63	x	0.7	=	147.32	(75)
Northeast	0.9x	0.77	x	1.65	x	91.1	x	0.63	x	0.7	=	137.82	(75)
Northeast	0.9x	0.77	x	1.65	x	72.63	x	0.63	x	0.7	=	109.87	(75)
Northeast	0.9x	0.77	x	1.65	x	50.42	x	0.63	x	0.7	=	76.28	(75)
Northeast	0.9x	0.77	x	1.65	x	28.07	x	0.63	x	0.7	=	42.46	(75)
Northeast	0.9x	0.77	x	1.65	x	14.2	x	0.63	x	0.7	=	21.48	(75)
Northeast	0.9x	0.77	x	1.65	x	9.21	x	0.63	x	0.7	=	13.94	(75)
Southwest	0.9x	0.77	x	7.98	x	36.79		0.63	x	0.7	=	89.73	(79)
Southwest	0.9x	0.77	x	6.93	x	36.79		0.63	x	0.7	=	77.93	(79)
Southwest	0.9x	0.77	x	7.98	x	62.67		0.63	x	0.7	=	152.85	(79)
Southwest	0.9x	0.77	x	6.93	x	62.67		0.63	x	0.7	=	132.74	(79)
Southwest	0.9x	0.77	x	7.98	x	85.75		0.63	x	0.7	=	209.13	(79)
Southwest	0.9x	0.77	x	6.93	x	85.75		0.63	x	0.7	=	181.62	(79)
Southwest	0.9x	0.77	x	7.98	x	106.25		0.63	x	0.7	=	259.13	(79)
Southwest	0.9x	0.77	x	6.93	x	106.25		0.63	x	0.7	=	225.03	(79)
Southwest	0.9x	0.77	x	7.98	x	119.01		0.63	x	0.7	=	290.24	(79)
Southwest	0.9x	0.77	x	6.93	x	119.01		0.63	x	0.7	=	252.05	(79)
Southwest	0.9x	0.77	x	7.98	x	118.15		0.63	x	0.7	=	288.14	(79)
Southwest	0.9x	0.77	x	6.93	x	118.15		0.63	x	0.7	=	250.23	(79)
Southwest	0.9x	0.77	x	7.98	x	113.91		0.63	x	0.7	=	277.8	(79)
Southwest	0.9x	0.77	x	6.93	x	113.91		0.63	x	0.7	=	241.25	(79)
Southwest	0.9x	0.77	x	7.98	x	104.39		0.63	x	0.7	=	254.59	(79)
Southwest	0.9x	0.77	x	6.93	x	104.39		0.63	x	0.7	=	221.09	(79)
Southwest	0.9x	0.77	x	7.98	x	92.85		0.63	x	0.7	=	226.45	(79)
Southwest	0.9x	0.77	x	6.93	x	92.85		0.63	x	0.7	=	196.65	(79)
Southwest	0.9x	0.77	x	7.98	x	69.27		0.63	x	0.7	=	168.93	(79)
Southwest	0.9x	0.77	x	6.93	x	69.27		0.63	x	0.7	=	146.7	(79)
Southwest	0.9x	0.77	x	7.98	x	44.07		0.63	x	0.7	=	107.48	(79)
Southwest	0.9x	0.77	x	6.93	x	44.07		0.63	x	0.7	=	93.34	(79)
Southwest	0.9x	0.77	x	7.98	x	31.49		0.63	x	0.7	=	76.79	(79)
Southwest	0.9x	0.77	x	6.93	x	31.49		0.63	x	0.7	=	66.69	(79)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m= 184.73 320.33 453.35 586.96 680.48 685.69 656.87 585.54 499.37 358.09 222.29 157.42 (83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m= 845.1 976.02 1085.14 1181.53 1236.71 1207.66 1158.83 1096.31 1031.58 927.75 833.63 800.52 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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SAP WorkSheet: New dwelling design stage

(86)m=	0.99	0.98	0.96	0.91	0.8	0.62	0.47	0.51	0.74	0.93	0.98	0.99	(86)
--------	------	------	------	------	-----	------	------	------	------	------	------	------	------

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.78	19.97	20.24	20.57	20.83	20.96	20.99	20.99	20.91	20.58	20.11	19.74	(87)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.83	19.83	19.83	19.84	19.84	19.85	19.85	19.86	19.85	19.84	19.84	19.83	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.88	0.74	0.53	0.35	0.39	0.65	0.9	0.98	0.99	(89)
--------	------	------	------	------	------	------	------	------	------	-----	------	------	------

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.74	18.93	19.2	19.52	19.74	19.84	19.85	19.85	19.8	19.53	19.08	18.72	(90)
--------	-------	-------	------	-------	-------	-------	-------	-------	------	-------	-------	-------	------

fLA = Living area ÷ (4) =	0.32	(91)
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Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.08	19.27	19.54	19.86	20.09	20.2	20.22	20.22	20.16	19.87	19.41	19.05	(92)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.08	19.27	19.54	19.86	20.09	20.2	20.22	20.22	20.16	19.87	19.41	19.05	(93)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains, hm:

(94)m=	0.99	0.97	0.94	0.88	0.75	0.56	0.39	0.43	0.68	0.9	0.97	0.99	(94)
--------	------	------	------	------	------	------	------	------	------	-----	------	------	------

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	832.65	948.9	1024.85	1037.56	928.02	673.32	447.72	469.5	698.88	835.49	810.43	791.03	(95)
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Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1894.63	1837.16	1663.5	1382.27	1056.13	698.03	451.31	475.24	758.43	1167.43	1556.95	1885.8	(97)
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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	790.11	596.91	475.16	248.19	95.32	0	0	0	0	246.96	537.5	814.51	(98)
--------	--------	--------	--------	--------	-------	---	---	---	---	--------	-------	--------	------

Total per year (kWh/year) = Sum(98) _{1...5,9...12} =	3804.66	(98)
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Space heating requirement in kWh/m²/year

39.17	(99)
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9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 245.56 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

790.11	596.91	475.16	248.19	95.32	0	0	0	0	246.96	537.5	814.51
--------	--------	--------	--------	-------	---	---	---	---	--------	-------	--------

(211)m = [(98)m x (204)] } x 100 ÷ (206) (211)

321.76	243.08	193.5	101.07	38.82	0	0	0	0	100.57	218.89	331.7
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Total (kWh/year) =Sum(211) _{1...5,10...12} =	1549.4	(211)
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SAP WorkSheet: New dwelling design stage

Space heating fuel (secondary), kWh/month

$$= \{[(98)m \times (201)]\} \times 100 \div (208)$$

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	
Total (kWh/year) =Sum(215) _{1..5,10...12} =													0 (215)

Water heating

Output from water heater (calculated above)

	205.86	181.33	190.18	170.12	166.45	148.35	142.12	156.44	156.32	176.42	187	200.78	
Efficiency of water heater													273.6 (216)
(217)m=	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	(217)

Fuel for water heating, kWh/month

$$(219)m = (64)m \times 100 \div (217)m$$

(219)m=	75.24	66.28	69.51	62.18	60.84	54.22	51.94	57.18	57.14	64.48	68.35	73.39	
Total = Sum(219a) _{1..12} =													760.74 (219)

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		1549.4
Water heating fuel used		760.74
Electricity for pumps, fans and electric keep-hot		
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0 (231)
Electricity for lighting		398.07 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2708.21 (238)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	13.19	204.37 (240)
Space heating - main system 2	(213) x	0	0 (241)
Space heating - secondary	(215) x	13.19	0 (242)
Water heating cost (other fuel)	(219)	13.19	100.34 (247)
Pumps, fans and electric keep-hot	(231)	13.19	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a			
Energy for lighting	(232)	13.19	52.51 (250)
Additional standing charges (Table 12)			0 (251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)...(254) =	357.21 (255)
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11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42 (256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.06 (257)
SAP rating (Section 12)		85.27 (258)

12a. CO2 emissions – Individual heating systems including micro-CHP

Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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SAP WorkSheet: New dwelling design stage

Space heating (main system 1)	(211) x	0.519	=	804.14	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	394.83	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1198.96	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	206.6	(268)
Total CO ₂ , kg/year		sum of (265)...(271) =		1405.56	(272)
CO₂ emissions per m²		(272) ÷ (4) =		14.47	(273)
El rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	4756.65	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2335.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7092.13	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	1222.06	(268)
'Total Primary Energy		sum of (265)...(271) =		8314.2	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		85.6	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:33

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 57.98m²

Site Reference : New Project

Plot Reference: Flat 8

Address : Flat 8, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.82 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.24 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 42.7 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls	Programmer and at least two room thermostats	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	1.65m ²	
Ventilation rate:	3.00	

10 Key features

Thermal bridging	0.036 W/m ² K
Party Walls U-value	0 W/m ² K

Predicted Energy Assessment



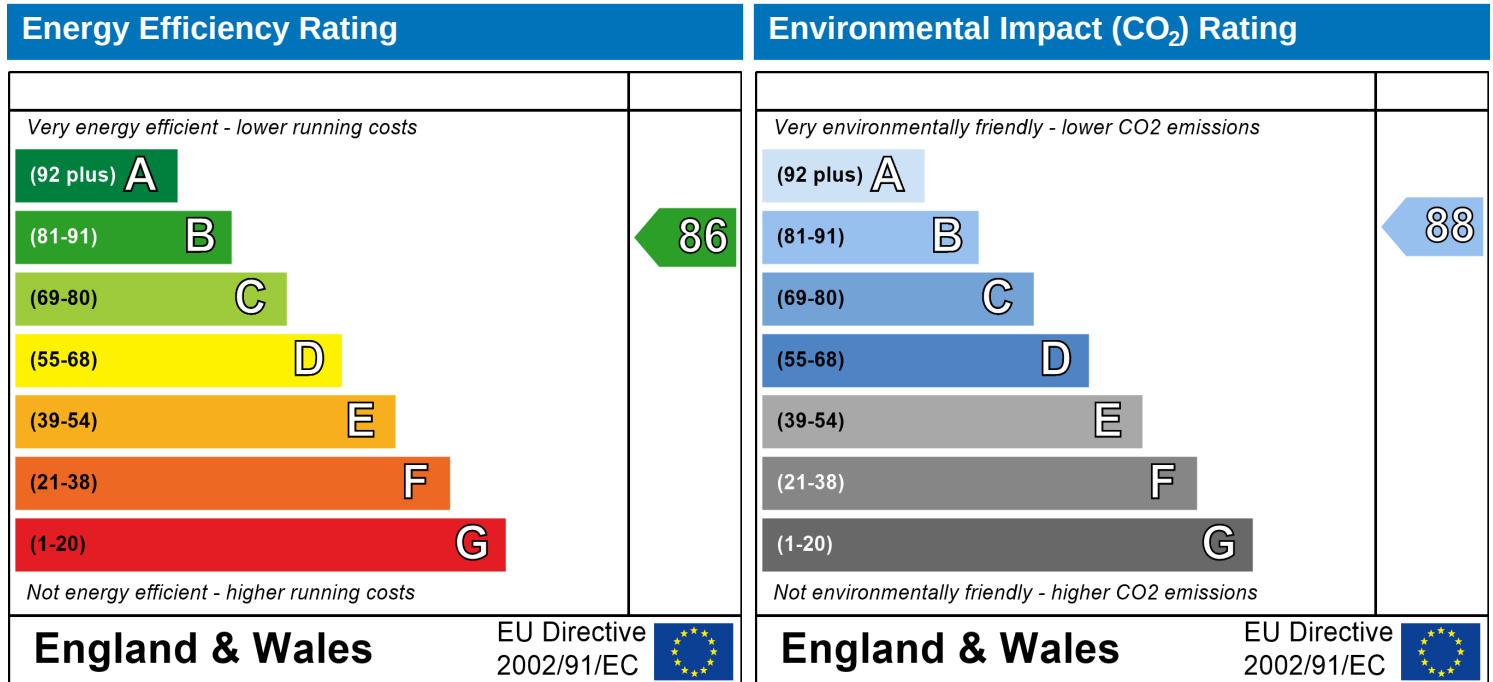
Flat 8
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Top floor Flat
07 December 2021
Ben Joannides
57.98 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 8

Address : Flat 8, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	57.98 (1a)	3 (2a)	173.94 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	57.98 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	173.94 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.11 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.36 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.36 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.47	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.36	0.39	0.41	0.43
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.61 0.6 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.58 0.59 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.61 0.6 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.58 0.59 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows			1.65	$\times 1/[1/(1.4) + 0.04] =$	2.19		(27)
Walls	9.9	1.65	8.25	$\times 0.24 =$	1.98		(29)
Roof Type1	35.74	0	35.74	$\times 0.16 =$	5.72		(30)
Roof Type2	52.11	0	52.11	$\times 0.16 =$	8.34		(30)
Total area of elements, m²			97.75				(31)
Party wall			76.35	$\times 0 =$	0		(32)
Party floor			57.98				(32a)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 18.22 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 6460.8 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.57 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 21.79 (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=	34.92	34.67	34.44	33.33	33.12	32.15	32.15	31.97	32.52	33.12	33.54	33.98

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	56.71	56.46	56.23	55.12	54.91	53.94	53.94	53.76	54.31	54.91	55.33	55.77
Average = Sum(39) _{1...12} /12=												55.12

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	0.98	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96		
Average = Sum(40) _{1...12} /12=													0.95	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

1.92

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

79.89

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	--	--

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	87.88	84.69	81.49	78.3	75.1	71.91	71.91	75.1	78.3	81.49	84.69	87.88		
Total = Sum(44) _{1...12} =													958.74	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	130.33	113.99	117.62	102.55	98.4	84.91	78.68	90.29	91.37	106.48	116.23	126.22		
Total = Sum(45) _{1...12} =													1257.05	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.55	17.1	17.64	15.38	14.76	12.74	11.8	13.54	13.7	15.97	17.43	18.93		(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
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If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
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Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
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SAP WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
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Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	175.35	154.65	162.65	146.12	143.42	128.48	123.71	135.31	134.94	151.5	159.8	171.24	(62)
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Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
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Output from water heater

(64)m=	175.35	154.65	162.65	146.12	143.42	128.48	123.71	135.31	134.94	151.5	159.8	171.24	
Output from water heater (annual) _{1...12}												1787.18	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	79.35	70.43	75.13	68.95	68.74	63.09	62.18	66.04	65.24	71.42	73.5	77.99	(65)
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include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	115.44	115.44	115.44	115.44	115.44	115.44	115.44	115.44	115.44	115.44	115.44	115.44	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	51.51	45.75	37.21	28.17	21.06	17.78	19.21	24.97	33.51	42.55	49.66	52.94	(67)
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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	250.49	253.08	246.53	232.59	214.99	198.44	187.39	184.79	191.34	205.29	222.89	239.43	(68)
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.47	48.47	48.47	48.47	48.47	48.47	48.47	48.47	48.47	48.47	48.47	48.47	(69)
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Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
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Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-76.96	-76.96	-76.96	-76.96	-76.96	-76.96	-76.96	-76.96	-76.96	-76.96	-76.96	-76.96	(71)
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Water heating gains (Table 5)

(72)m=	106.66	104.81	100.98	95.77	92.39	87.62	83.58	88.76	90.61	96	102.09	104.82	(72)
--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	----	--------	--------	------

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	495.6	490.6	471.67	443.48	415.38	390.79	377.13	385.47	402.41	430.79	461.59	484.14	(73)
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6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.65	x	11.28	x	0.63	x	0.7	=	5.69	(75)
Northeast 0.9x	0.77	x	1.65	x	22.97	x	0.63	x	0.7	=	11.58	(75)
Northeast 0.9x	0.77	x	1.65	x	41.38	x	0.63	x	0.7	=	20.87	(75)
Northeast 0.9x	0.77	x	1.65	x	67.96	x	0.63	x	0.7	=	34.27	(75)
Northeast 0.9x	0.77	x	1.65	x	91.35	x	0.63	x	0.7	=	46.06	(75)

SAP WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	1.65	x	97.38	x	0.63	x	0.7	=	49.11	(75)
Northeast 0.9x	0.77	x	1.65	x	91.1	x	0.63	x	0.7	=	45.94	(75)
Northeast 0.9x	0.77	x	1.65	x	72.63	x	0.63	x	0.7	=	36.62	(75)
Northeast 0.9x	0.77	x	1.65	x	50.42	x	0.63	x	0.7	=	25.43	(75)
Northeast 0.9x	0.77	x	1.65	x	28.07	x	0.63	x	0.7	=	14.15	(75)
Northeast 0.9x	0.77	x	1.65	x	14.2	x	0.63	x	0.7	=	7.16	(75)
Northeast 0.9x	0.77	x	1.65	x	9.21	x	0.63	x	0.7	=	4.65	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ... (82)m

(83)m=	5.69	11.58	20.87	34.27	46.06	49.11	45.94	36.62	25.43	14.15	7.16	4.65	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	501.29	502.18	492.54	477.74	461.44	439.9	423.06	422.1	427.83	444.94	468.75	488.79	(84)
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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.98	0.96	0.89	0.74	0.55	0.58	0.79	0.94	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.25	20.31	20.44	20.64	20.84	20.96	20.99	20.99	20.94	20.74	20.47	20.24	(87)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.1	20.11	20.11	20.12	20.13	20.14	20.14	20.14	20.14	20.13	20.12	20.12	(88)
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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.98	0.97	0.94	0.86	0.66	0.45	0.47	0.72	0.91	0.97	0.99	(89)
--------	------	------	------	------	------	------	------	------	------	------	------	------	------

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.43	19.49	19.63	19.84	20.01	20.12	20.14	20.14	20.1	19.93	19.67	19.44	(90)
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fLA = Living area ÷ (4) = 0.49 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.83	19.89	20.03	20.23	20.42	20.54	20.56	20.56	20.52	20.33	20.07	19.83	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.83	19.89	20.03	20.23	20.42	20.54	20.56	20.56	20.52	20.33	20.07	19.83	(93)
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8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Utilisation factor for gains, hm:

(94)m=	0.98	0.98	0.97	0.94	0.87	0.69	0.5	0.52	0.76	0.92	0.97	0.98	(94)
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Useful gains, hmGm , W = (94)m x (84)m

(95)m=	492.56	491.75	477.64	450.08	401.49	305.63	211.86	221.35	323.33	409.6	454.51	481.21	(95)
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Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m – (96)m]

(97)m=	880.74	846.59	760.73	624.68	478.73	320.31	213.66	223.72	348.48	534.33	717.4	871.81	(97)
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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	288.8	238.45	210.62	125.72	57.47	0	0	0	0	92.8	189.28	290.61	
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SAP WorkSheet: New dwelling design stage

Total per year (kWh/year) = Sum(98)_{1...5,9...12} = 1493.74 (98)

Space heating requirement in kWh/m²/year 25.76 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 187.27 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

288.8	238.45	210.62	125.72	57.47	0	0	0	0	92.8	189.28	290.61
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(211)m = {[(98)m × (204)] } × 100 ÷ (206) (211)

154.22	127.33	112.47	67.13	30.69	0	0	0	0	49.55	101.08	155.18
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Total (kWh/year) = Sum(211)_{1...5,10...12} = 797.64 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m × (201)] } × 100 ÷ (208)

(215)m=

0	0	0	0	0	0	0	0	0	0	0	0
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Total (kWh/year) = Sum(215)_{1...5,10...12} = 0 (215)

Water heating

Output from water heater (calculated above)

175.35	154.65	162.65	146.12	143.42	128.48	123.71	135.31	134.94	151.5	159.8	171.24
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Efficiency of water heater 273.6 (216)

(217)m= 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 273.6 (217)

Fuel for water heating, kWh/month

(219)m = (64)m × 100 ÷ (217)m

(219)m=

64.09	56.53	59.45	53.41	52.42	46.96	45.21	49.46	49.32	55.37	58.41	62.59
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Total = Sum(219a)_{1...12} = 653.21 (219)

Annual totals

Space heating fuel used, main system 1 797.64 kWh/year

Water heating fuel used 653.21 kWh/year

Electricity for pumps, fans and electric keep-hot

Total electricity for the above, kWh/year sum of (230a)...(230g) = 0 (231)

Electricity for lighting 363.88 (232)

Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) = 1814.74 (338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) ×	13.19 × 0.01 =	105.21 (240)
Space heating - main system 2	(213) ×	0 × 0.01 =	0 (241)

SAP WorkSheet: New dwelling design stage

Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	86.16	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a)					
Energy for lighting	(232)	13.19	x 0.01 =	48	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)...(254) =			239.36	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	$[(255) \times (256)] \div [(4) + 45.0] =$	0.98	(257)
SAP rating (Section 12)		86.38	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519	= 413.98 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.519	= 339.02 (264)
Space and water heating	(261) + (262) + (263) + (264) =		752.99 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= 0 (267)
Electricity for lighting	(232) x	0.519	= 188.86 (268)
Total CO2, kg/year		sum of (265)...(271) =	941.85 (272)
CO2 emissions per m²		(272) ÷ (4) =	16.24 (273)
EI rating (section 14)			88 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	3.07	= 2448.77 (261)
Space heating (secondary)	(215) x	3.07	= 0 (263)
Energy for water heating	(219) x	3.07	= 2005.35 (264)
Space and water heating	(261) + (262) + (263) + (264) =		4454.12 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	= 0 (267)
Electricity for lighting	(232) x	0	= 1117.12 (268)
'Total Primary Energy		sum of (265)...(271) =	5571.24 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	96.09 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 08 December 2021 at 12:33:31

Project Information:

Assessed By: Ben Joannides (STRO035972)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 70.74m²

Site Reference : New Project

Plot Reference: Flat 9

Address : Flat 9, 52-58 Queens Road , Reading, RG1 4RP

Client Details:

Name:

Address :

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 system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.56 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.98 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 51.4 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.30 kWh/day Permitted by DBSCG: 1.89 kWh/day	OK
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Regulations Compliance Report

Primary pipework insulated: Yes **OK**

6 Controls

Space heating controls: Programmer and at least two room thermostats **OK**
Hot water controls: Cylinderstat **OK**
Independent timer for DHW **OK**
Boiler interlock: Yes **OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings 100.0%
Minimum 75.0% **OK**

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley): Slight **OK**
Based on:
Overshading: Average or unknown
Windows facing: North East 1.65m²
Windows facing: North West 3.3m²
Ventilation rate: 3.00

10 Key features

Party Walls U-value 0 W/m²K

Predicted Energy Assessment



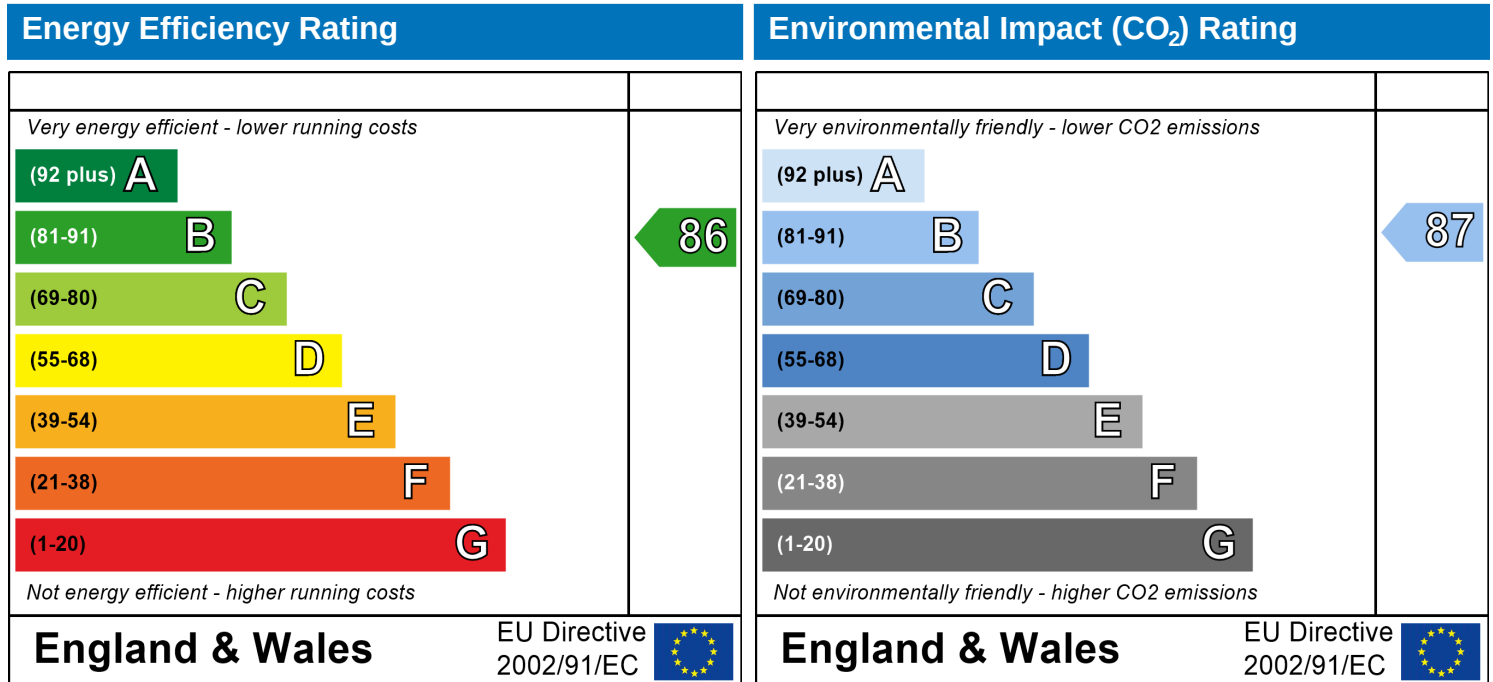
Flat 9
52-58 Queens Road
Reading
RG1 4RP

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Top floor Flat
07 December 2021
Ben Joannides
70.74 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name: Ben Joannides **Stroma Number:** STRO035972
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.50

Property Address: Flat 9

Address : Flat 9, 52-58 Queens Road , Reading, RG1 4RP

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	70.74 (1a)	3 (2a)	212.22 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.74 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	212.22 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				2	20 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.09 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.34 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.34 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4
------	------	------	------	------	------	------	------	------	------	------	-----

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)) , otherwise (23b) = (23a)

0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 (24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m= 0.6 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m= 0.6 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Windows Type 1			1.65	$\times 1/[1/(1.4) + 0.04] =$	2.19		(27)
Windows Type 2			1.65	$\times 1/[1/(1.4) + 0.04] =$	2.19		(27)
Walls	30.8	4.95	25.85	$\times 0.24 =$	6.2		(29)
Roof Type1	42.7	0	42.7	$\times 0.16 =$	6.83		(30)
Roof Type2	63.72	0	63.72	$\times 0.16 =$	10.2		(30)
Total area of elements, m²			137.22				(31)
Party wall			52.2	$\times 0 =$	0		(32)
Party floor			70.74				(32a)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ as given in paragraph 3.2

** include the areas on both sides of internal walls and partitions

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 29.79 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 6979.98 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.78 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m= 41.76 41.5 41.24 40.04 39.81 38.76 38.76 38.57 39.17 39.81 40.27 40.75 (38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m= 78.54 78.28 78.03 76.82 76.59 75.54 75.54 75.35 75.95 76.59 77.05 77.53
Average = Sum(39)_{1...12} /12= 76.82 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K

$$(40)m = (39)m \div (4)$$

(40)m=	1.11	1.11	1.1	1.09	1.08	1.07	1.07	1.07	1.07	1.08	1.09	1.1		
Average = Sum(40) _{1..12} /12=													1.09	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.26

(42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

if TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36

87.97

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	96.77	93.25	89.73	86.21	82.69	79.17	79.17	82.69	86.21	89.73	93.25	96.77		
Total = Sum(44) _{1..12} =													1055.63	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	143.5	125.51	129.51	112.91	108.34	93.49	86.63	99.41	100.6	117.24	127.98	138.97		
Total = Sum(45) _{1...12} =													1384.09	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.53	18.83	19.43	16.94	16.25	14.02	12.99	14.91	15.09	17.59	19.2	20.85		(46)
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel

150

(47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):

1.3

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

$$(48) \times (49) =$$

0.7

(50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0

(54)

Enter (50) or (54) in (55)

0.7

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(56)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	21.76	19.66	21.76	21.06	21.76	21.06	21.76	21.76	21.06	21.76	21.06	21.76		(57)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Primary circuit loss (annual) from Table 3

0

(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
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SAP WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	(61)
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Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	188.53	166.17	174.54	156.48	153.37	137.06	131.66	144.44	144.17	162.26	171.55	184	(62)
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Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	(63)
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Output from water heater

(64)m=	188.53	166.17	174.54	156.48	153.37	137.06	131.66	144.44	144.17	162.26	171.55	184	
Output from water heater (annual) _{1...12}												1914.22	(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	83.73	74.26	79.08	72.4	72.04	65.94	64.82	69.07	68.31	75	77.41	82.23	(65)
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include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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=	135.84	135.84	135.84	135.84	135.84	135.84	135.84	135.84	135.84	135.84	135.84	135.84	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	54.83	48.7	39.61	29.99	22.41	18.92	20.45	26.58	35.67	45.3	52.87	56.36	(67)
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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	297.04	300.12	292.36	275.82	254.95	235.33	222.22	219.14	226.91	243.44	264.32	283.94	(68)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.85	50.85	50.85	50.85	50.85	50.85	50.85	50.85	50.85	50.85	50.85	50.85	(69)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
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Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	-90.56	(71)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Water heating gains (Table 5)

(72)m=	112.55	110.51	106.29	100.56	96.83	91.59	87.13	92.84	94.87	100.81	107.51	110.52	(72)
--------	--------	--------	--------	--------	-------	-------	-------	-------	-------	--------	--------	--------	------

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	560.55	555.47	534.38	502.49	470.32	441.97	425.93	434.69	453.58	485.67	520.82	546.94	(73)
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6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.65	x	11.28	x	0.63	x	0.7	=	5.69	(75)
Northeast 0.9x	0.77	x	1.65	x	22.97	x	0.63	x	0.7	=	11.58	(75)
Northeast 0.9x	0.77	x	1.65	x	41.38	x	0.63	x	0.7	=	20.87	(75)
Northeast 0.9x	0.77	x	1.65	x	67.96	x	0.63	x	0.7	=	34.27	(75)
Northeast 0.9x	0.77	x	1.65	x	91.35	x	0.63	x	0.7	=	46.06	(75)

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Northeast 0.9x	0.77	x	1.65	x	97.38	x	0.63	x	0.7	=	49.11	(75)
Northeast 0.9x	0.77	x	1.65	x	91.1	x	0.63	x	0.7	=	45.94	(75)
Northeast 0.9x	0.77	x	1.65	x	72.63	x	0.63	x	0.7	=	36.62	(75)
Northeast 0.9x	0.77	x	1.65	x	50.42	x	0.63	x	0.7	=	25.43	(75)
Northeast 0.9x	0.77	x	1.65	x	28.07	x	0.63	x	0.7	=	14.15	(75)
Northeast 0.9x	0.77	x	1.65	x	14.2	x	0.63	x	0.7	=	7.16	(75)
Northeast 0.9x	0.77	x	1.65	x	9.21	x	0.63	x	0.7	=	4.65	(75)
Northwest 0.9x	0.77	x	1.65	x	11.28	x	0.63	x	0.7	=	11.38	(81)
Northwest 0.9x	0.77	x	1.65	x	22.97	x	0.63	x	0.7	=	23.16	(81)
Northwest 0.9x	0.77	x	1.65	x	41.38	x	0.63	x	0.7	=	41.73	(81)
Northwest 0.9x	0.77	x	1.65	x	67.96	x	0.63	x	0.7	=	68.54	(81)
Northwest 0.9x	0.77	x	1.65	x	91.35	x	0.63	x	0.7	=	92.12	(81)
Northwest 0.9x	0.77	x	1.65	x	97.38	x	0.63	x	0.7	=	98.21	(81)
Northwest 0.9x	0.77	x	1.65	x	91.1	x	0.63	x	0.7	=	91.88	(81)
Northwest 0.9x	0.77	x	1.65	x	72.63	x	0.63	x	0.7	=	73.25	(81)
Northwest 0.9x	0.77	x	1.65	x	50.42	x	0.63	x	0.7	=	50.85	(81)
Northwest 0.9x	0.77	x	1.65	x	28.07	x	0.63	x	0.7	=	28.31	(81)
Northwest 0.9x	0.77	x	1.65	x	14.2	x	0.63	x	0.7	=	14.32	(81)
Northwest 0.9x	0.77	x	1.65	x	9.21	x	0.63	x	0.7	=	9.29	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ... (82)m

(83)m=	17.07	34.74	62.6	102.8	138.19	147.32	137.82	109.87	76.28	42.46	21.48	13.94	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	577.62	590.21	596.98	605.29	608.51	589.29	563.74	544.56	529.85	528.13	542.3	560.88	(84)
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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.98	0.96	0.9	0.75	0.57	0.61	0.84	0.96	0.99	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.01	20.09	20.27	20.53	20.78	20.94	20.99	20.98	20.89	20.61	20.27	20	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.99	20	20	20.01	20.01	20.03	20.03	20.03	20.02	20.01	20.01	20	(88)
--------	-------	----	----	-------	-------	-------	-------	-------	-------	-------	-------	----	------

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.98	0.95	0.86	0.66	0.46	0.5	0.77	0.94	0.98	0.99	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.11	19.19	19.37	19.63	19.86	20	20.02	20.02	19.96	19.71	19.38	19.11	(90)
--------	-------	-------	-------	-------	-------	----	-------	-------	-------	-------	-------	-------	------

$$fLA = \text{Living area} \div (4) = 0.41 \quad (91)$$

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

(92)m=	19.48	19.57	19.74	20	20.24	20.39	20.42	20.42	20.35	20.08	19.75	19.48	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

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(93)m=

19.48	19.57	19.74	20	20.24	20.39	20.42	20.42	20.35	20.08	19.75	19.48
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 (93)

8. Space heating requirement

Set $T_{i,m}$ to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains, h_{m} :

(94)m=

0.99	0.98	0.97	0.95	0.87	0.7	0.51	0.55	0.79	0.94	0.98	0.99
------	------	------	------	------	-----	------	------	------	------	------	------

 (94)

Useful gains, $h_{m}G_{m}$, $W = (94)m \times (84)m$

(95)m=

570.52	580.95	581.92	572.57	529.08	410.37	284.82	297.05	419.48	497.13	530.94	554.88
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (95)

Monthly average external temperature from Table 8

(96)m=

4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2
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 (96)

Heat loss rate for mean internal temperature, L_{m} , $W = [(39)m \times [(93)m - (96)m]]$

(97)m=

1192.67	1148.12	1033.35	852.91	654.22	437.47	288.85	303.05	474.43	726.49	974.79	1184.52
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 (97)

Space heating requirement for each month, $kWh/month = 0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=

462.88	381.14	335.86	201.85	93.11	0	0	0	0	170.64	319.57	468.46
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Total per year ($kWh/year$) = $Sum(98)_{1..5,9..12} =$

2433.51

 (98)

Space heating requirement in $kWh/m^2/year$

34.4

 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system

0

 (201)

Fraction of space heat from main system(s) (202) = $1 - (201) =$

1

 (202)

Fraction of total heating from main system 1 (204) = $(202) \times [1 - (203)] =$

1

 (204)

Efficiency of main space heating system 1

231.71

 (206)

Efficiency of secondary/supplementary heating system, %

0

 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

462.88	381.14	335.86	201.85	93.11	0	0	0	0	170.64	319.57	468.46
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

199.76	164.49	144.95	87.11	40.18	0	0	0	0	73.64	137.92	202.17
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Total ($kWh/year$) = $Sum(211)_{1..5,10..12} =$

1050.22

 (211)

Space heating fuel (secondary), $kWh/month$

= $\{[(98)m \times (201)]\} \times 100 \div (208)$

(215)m=

0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---

Total ($kWh/year$) = $Sum(215)_{1..5,10..12} =$

0

 (215)

Water heating

Output from water heater (calculated above)

188.53	166.17	174.54	156.48	153.37	137.06	131.66	144.44	144.17	162.26	171.55	184
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Efficiency of water heater

273.6

 (216)

(217)m=

273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6	273.6
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 (217)

Fuel for water heating, $kWh/month$

(219)m = $(64)m \times 100 \div (217)m$

(219)m=

68.91	60.74	63.79	57.19	56.05	50.1	48.12	52.79	52.69	59.31	62.7	67.25
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Total = $Sum(219a)_{1..12} =$

699.64

 (219)

Annual totals

Space heating fuel used, main system 1

kWh/year

kWh/year

1050.22

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Water heating fuel used		699.64	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0	(231)
Electricity for lighting		387.36	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2137.22	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	138.52 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	92.28 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	0 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19	x 0.01 =	51.09 (250)
Additional standing charges (Table 12)				0 (251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =			281.9 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.02	(257)
SAP rating (Section 12)		85.73	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	545.06 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	363.11 (264)
Space and water heating	(261) + (262) + (263) + (264) =			908.18 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	201.04 (268)
Total CO2, kg/year			sum of (265)...(271) =	1109.22 (272)
CO2 emissions per m²			(272) ÷ (4) =	15.68 (273)
EI rating (section 14)				87 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	3224.18 (261)

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Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2147.9	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5372.08	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0	(267)
Electricity for lighting	(232) x	0	=	1189.18	(268)
'Total Primary Energy	sum of (265)...(271) =			6561.26	(272)
Primary energy kWh/m ² /year	(272) ÷ (4) =			92.75	(273)