Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
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Project Information:

Assessed By: Carlos Melgar (STRO031596) | **Building Type:** Mid-terrace Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE | Total Floor Area: 115.56m²

Site Reference : Kings Mews Be Green | **Plot Reference:** Plot 001

Address : 1, 10-11 Kings Mews, WC1N 2ES

Client Details:

Name: James Taylor

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)	23.86 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.81 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.16 (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	0.16 (max. 0.20)	0.16 (max. 0.35)	**OK**
Openings	1.37 (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	2.50 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - electric
Direct acting electric boiler

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 0.93 kWh/day	
	Permitted by DBSCG: 1.03 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

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6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.69	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	6.12m²
Windows facing: North East	6.12m²
Roof windows facing: Horizontal	7.45m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Air permeablility	2.5 m³/m²h
Doors U-value	1.09 W/m²K
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Photovoltaic array	

Predicted Energy Assessment

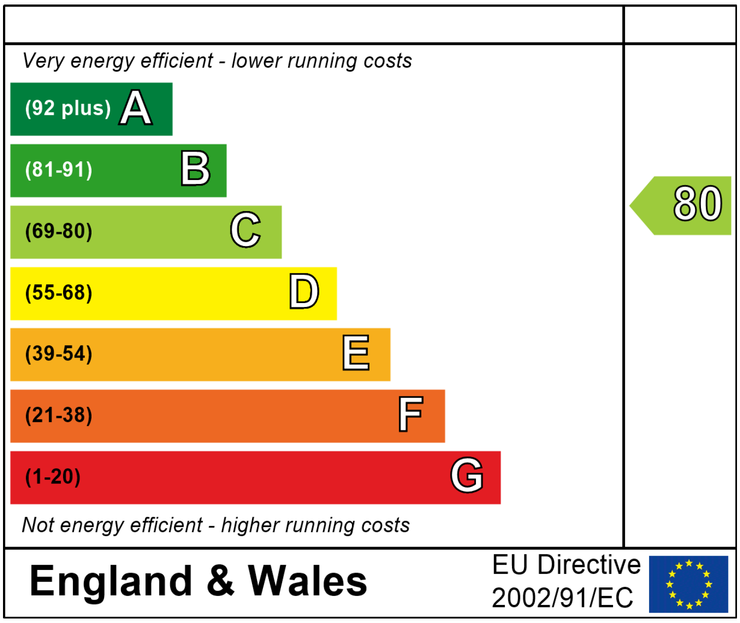
1
10-11 Kings Mews
WC1N 2ES

Dwelling type:	Mid-terrace Ground floor Flat
Date of assessment:	19 July 2018
Produced by:	Carlos Melgar
Total floor area:	115.56 m²

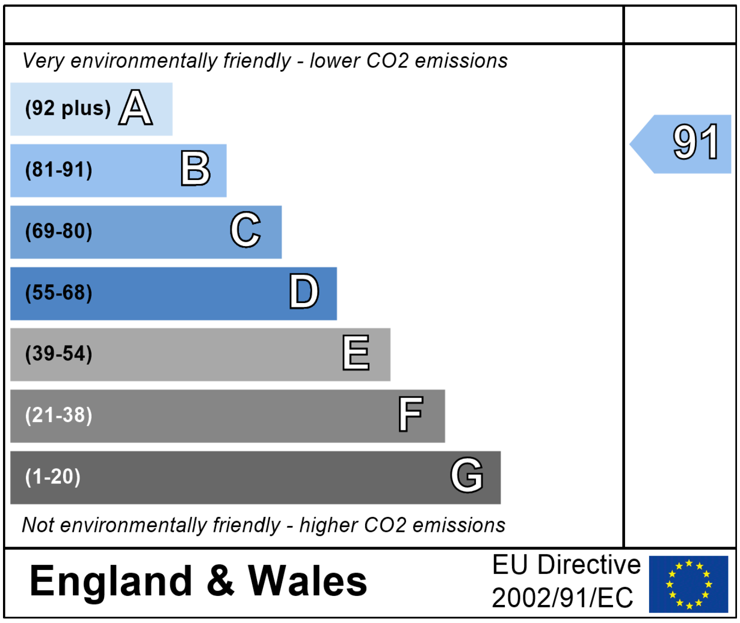
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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 carbonn 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:	Carlos Melgar	**Stroma Number:**	STRO031596
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.16

Property Address: Plot 001

Address : 1, 10-11 Kings Mews, WC1N 2ES

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	72.89	(1a)	x	2.41	(2a)	=	175.66	(3a)
First floor	42.67	(1b)	x	3	(2b)	=	128.01	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	115.56	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	303.67	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(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) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

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		0	(11)

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

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		2.5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.12	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.09	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

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

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

0.11	0.11	0.11	0.1	0.09	0.08	0.08	0.08	0.09	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

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

(24a)m=	0.24	0.24	0.23	0.22	0.22	0.21	0.21	0.21	0.21	0.22	0.22	0.23	(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 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.24	0.24	0.23	0.22	0.22	0.21	0.21	0.21	0.21	0.22	0.22	0.23	(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	
Doors			2.1	x	1.09	=	2.289			(26)
Windows Type 1			6.12	x1/[1/(1.4)+ 0.04]		=	8.11			(27)
Windows Type 2			6.12	x1/[1/(1.4)+ 0.04]		=	8.11			(27)
Rooflights			7.45	x1/[1/(1.4) + 0.04]		=	10.43			(27b)
Floor			72.89	x	0.13	=	9.475699	110	8017.9	(28)
Walls Type1	40.18	12.24	27.94	x	0.16	=	4.47	49.5	1383.03	(29)
Walls Type2	36.31	2.1	34.21	x	0.14	=	4.84	49.5	1693.4	(29)
Walls Type3	59.79	0	59.79	x	0.12	=	7.17	17	1016.43	(29)
Roof Type1	10.21	7.45	2.76	x	0.16	=	0.44	9	24.84	(30)
Roof Type2	23.02	0	23.02	x	0.16	=	3.68	9	207.18	(30)
Total area of elements, m²			242.4							(31)
Party wall			78.12	x	0	=	0	49.5	3866.94	(32)
Party ceiling			42.67					30	1280.1	(32b)
Internal wall **			159.73					9	1437.57	(32c)
Internal floor			42.67					18	768.0599	(32d)
Internal ceiling			42.67					9	384.03	(32e)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-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) = 58.48 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	20079.48	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	= (34) ÷ (4) =	173.76	(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		14.13	(36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss	(33) + (36) =	72.61	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	23.81	23.59	23.37	22.27	22.05	20.96	20.96	20.74	21.4	22.05	22.49	22.93	(38)

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

(39)m=	96.41	96.19	95.97	94.88	94.66	93.56	93.56	93.34	94	94.66	95.1	95.54	

Average = Sum(39)$_{1…12}$ /12= 94.82 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.83	0.83	0.83	0.82	0.82	0.81	0.81	0.81	0.81	0.82	0.82	0.83	

Average = Sum(40)$_{1…12}$ /12= 0.82 (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 2.84 (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) + 36 101.75 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	111.93	107.86	103.79	99.72	95.65	91.58	91.58	95.65	99.72	103.79	107.86	111.93	

Total = Sum(44)$_{1…12}$ = 1221.05 (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=	165.99	145.17	149.81	130.61	125.32	108.14	100.21	114.99	116.36	135.61	148.03	160.75	

Total = Sum(45)$_{1…12}$ = 1600.99 (45)

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

(46)m=	24.9	21.78	22.47	19.59	18.8	16.22	15.03	17.25	17.45	20.34	22.2	24.11	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 50 (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): 0.93 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.5 (50)

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

SAP WorkSheet: New dwelling design stage

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) x (51) x (52) x (53) = | 0 | (54)

Enter (50) or (54) in (55) | 0.5 | (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	15.57	14.06	15.57	15.07	15.57	15.07	15.57	15.57	15.07	15.57	15.07	15.57	(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=	15.57	14.06	15.57	15.07	15.57	15.07	15.57	15.57	15.07	15.57	15.07	15.57	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	181.56	159.24	165.38	145.67	140.89	123.21	115.78	130.56	131.43	151.18	163.1	176.32	(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=	181.56	159.24	165.38	145.67	140.89	123.21	115.78	130.56	131.43	151.18	163.1	176.32

Output from water heater (annual)$_{1…12}$ | 1784.3 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	67.65	59.52	62.27	55.48	54.12	48.01	45.77	50.69	50.74	57.55	61.27	65.9	(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=	170.66	170.66	170.66	170.66	170.66	170.66	170.66	170.66	170.66	170.66	170.66	170.66	(66)

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

(67)m=	71.01	63.07	51.29	38.83	29.03	24.51	26.48	34.42	46.2	58.66	68.46	72.98	(67)

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

(68)m=	416.89	421.21	410.31	387.1	357.81	330.28	311.88	307.56	318.46	341.66	370.96	398.49	(68)

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

(69)m=	54.91	54.91	54.91	54.91	54.91	54.91	54.91	54.91	54.91	54.91	54.91	54.91	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-113.78	-113.78	-113.78	-113.78	-113.78	-113.78	-113.78	-113.78	-113.78	-113.78	-113.78	-113.78	(71)

Water heating gains (Table 5)

(72)m=	90.92	88.57	83.69	77.05	72.75	66.68	61.52	68.13	70.48	77.35	85.1	88.58	(72)

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

(73)m=	693.62	687.65	660.09	617.79	574.38	536.26	514.68	524.9	549.93	592.47	639.32	674.86	(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 m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	6.12	x	11.28	x	0.51	x	1.11	=	27.12	(75)
Northeast	0.9x	0.77	x	6.12	x	22.97	x	0.51	x	1.11	=	55.2	(75)
Northeast	0.9x	0.77	x	6.12	x	41.38	x	0.51	x	1.11	=	99.45	(75)
Northeast	0.9x	0.77	x	6.12	x	67.96	x	0.51	x	1.11	=	163.32	(75)
Northeast	0.9x	0.77	x	6.12	x	91.35	x	0.51	x	1.11	=	219.53	(75)
Northeast	0.9x	0.77	x	6.12	x	97.38	x	0.51	x	1.11	=	234.05	(75)
Northeast	0.9x	0.77	x	6.12	x	91.1	x	0.51	x	1.11	=	218.95	(75)
Northeast	0.9x	0.77	x	6.12	x	72.63	x	0.51	x	1.11	=	174.55	(75)
Northeast	0.9x	0.77	x	6.12	x	50.42	x	0.51	x	1.11	=	121.18	(75)
Northeast	0.9x	0.77	x	6.12	x	28.07	x	0.51	x	1.11	=	67.45	(75)
Northeast	0.9x	0.77	x	6.12	x	14.2	x	0.51	x	1.11	=	34.12	(75)
Northeast	0.9x	0.77	x	6.12	x	9.21	x	0.51	x	1.11	=	22.14	(75)
Southwest	0.9x	0.77	x	6.12	x	36.79		0.51	x	1.11	=	88.43	(79)
Southwest	0.9x	0.77	x	6.12	x	62.67		0.51	x	1.11	=	150.62	(79)
Southwest	0.9x	0.77	x	6.12	x	85.75		0.51	x	1.11	=	206.09	(79)
Southwest	0.9x	0.77	x	6.12	x	106.25		0.51	x	1.11	=	255.36	(79)
Southwest	0.9x	0.77	x	6.12	x	119.01		0.51	x	1.11	=	286.02	(79)
Southwest	0.9x	0.77	x	6.12	x	118.15		0.51	x	1.11	=	283.95	(79)
Southwest	0.9x	0.77	x	6.12	x	113.91		0.51	x	1.11	=	273.76	(79)
Southwest	0.9x	0.77	x	6.12	x	104.39		0.51	x	1.11	=	250.88	(79)
Southwest	0.9x	0.77	x	6.12	x	92.85		0.51	x	1.11	=	223.15	(79)
Southwest	0.9x	0.77	x	6.12	x	69.27		0.51	x	1.11	=	166.47	(79)
Southwest	0.9x	0.77	x	6.12	x	44.07		0.51	x	1.11	=	105.92	(79)
Southwest	0.9x	0.77	x	6.12	x	31.49		0.51	x	1.11	=	75.68	(79)
Rooflights	0.9x	1	x	7.45	x	26	x	0.6	x	0	=	116.22	(82)
Rooflights	0.9x	1	x	7.45	x	54	x	0.6	x	1.11	=	241.38	(82)
Rooflights	0.9x	1	x	7.45	x	96	x	0.6	x	1.11	=	429.12	(82)
Rooflights	0.9x	1	x	7.45	x	150	x	0.6	x	1.11	=	670.5	(82)
Rooflights	0.9x	1	x	7.45	x	192	x	0.6	x	1.11	=	858.24	(82)
Rooflights	0.9x	1	x	7.45	x	200	x	0.6	x	1.11	=	894	(82)
Rooflights	0.9x	1	x	7.45	x	189	x	0.6	x	1.11	=	844.83	(82)
Rooflights	0.9x	1	x	7.45	x	157	x	0.6	x	1.11	=	701.79	(82)
Rooflights	0.9x	1	x	7.45	x	115	x	0.6	x	1.11	=	514.05	(82)
Rooflights	0.9x	1	x	7.45	x	66	x	0.6	x	1.11	=	295.02	(82)

Rooflights 0.9x	1	x	7.45	x	33	x	0.6	x	1.11	=	147.51	(82)
Rooflights 0.9x	1	x	7.45	x	21	x	0.6	x	1.11	=	93.87	(82)

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

(83)m=	231.76	447.2	734.66	1089.18	1363.8	1412	1337.54	1127.22	858.38	528.95	287.55	191.69	(83)

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

(84)m=	925.38	1134.86	1394.75	1706.97	1938.18	1948.26	1852.22	1652.12	1408.31	1121.41	926.87	866.55	(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	0.93	0.83	0.64	0.45	0.31	0.22	0.26	0.46	0.77	0.94	0.98	(86)

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

(87)m=	20.17	20.43	20.73	20.93	20.99	21	21	21	20.99	20.86	20.48	20.12	(87)

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

(88)m=	20.22	20.23	20.23	20.24	20.24	20.24	20.24	20.25	20.24	20.24	20.23	20.23	(88)

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

(89)m=	0.96	0.92	0.81	0.6	0.41	0.27	0.18	0.22	0.41	0.74	0.93	0.97	(89)

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

(90)m=	19.13	19.49	19.9	20.16	20.23	20.24	20.24	20.25	20.23	20.09	19.57	19.06	(90)

fLA = Living area ÷ (4) = 0.21 (91)

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

(92)m=	19.36	19.69	20.07	20.33	20.39	20.41	20.41	20.41	20.4	20.25	19.77	19.29	(92)

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

(93)m=	19.21	19.54	19.92	20.18	20.24	20.26	20.26	20.26	20.25	20.1	19.62	19.14	(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=	0.95	0.91	0.8	0.6	0.41	0.27	0.18	0.22	0.41	0.73	0.92	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	883.33	1027.54	1109.2	1026.99	801.92	528.54	342.03	359.92	573.63	817.27	849.04	835.23	(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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1437.05	1408.38	1288.39	1069.77	808.29	529.13	342.09	360.06	577.77	899.63	1190.16	1426.87	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	411.96	255.93	133.32	30.81	4.74	0	0	0	0	61.28	245.61	440.18	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1583.82 (98)

Space heating requirement in kWh/m²/year 13.71 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

SAP WorkSheet: New dwelling design stage

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		100	(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)	411.96	255.93	133.32	30.81	4.74	0	0	0	0	61.28	245.61	440.18		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	411.96	255.93	133.32	30.81	4.74	0	0	0	0	61.28	245.61	440.18		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1583.82	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (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)	181.56	159.24	165.38	145.67	140.89	123.21	115.78	130.56	131.43	151.18	163.1	176.32		
Efficiency of water heater													100	(216)
(217)m=	100	100	100	100	100	100	100	100	100	100	100	100		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	181.56	159.24	165.38	145.67	140.89	123.21	115.78	130.56	131.43	151.18	163.1	176.32		
Total = Sum(219a)$_{1...12}$ =													1784.3	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1583.82	
Water heating fuel used			1784.3	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		319.54		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		349.54	(231)
Electricity for lighting			501.63	(232)
Electricity generated by PVs			-2140.5	(233)

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 =	208.91	(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 =	235.35	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	46.1	(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 =	66.16	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	0	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			556.52	(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] =	1.46	(257)
SAP rating (Section 12)		79.69	(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	=	822	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	926.05	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1748.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	181.41	(267)
Electricity for lighting	(232) x	0.519	=	260.35	(268)
Energy saving/generation technologies Item 1		0.519	=	-1110.92	(269)
Total CO2, kg/year		sum of (265)…(271) =		1078.89	(272)
CO2 emissions per m²		(272) ÷ (4) =		9.34	(273)
EI rating (section 14)				91	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	4862.32	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	5477.79	(264)
Space and water heating	(261) + (262) + (263) + (264) =			10340.11	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	1073.09	(267)
Electricity for lighting	(232) x	0	=	1540	(268)
Energy saving/generation technologies Item 1		3.07	=	-6571.35	(269)
'Total Primary Energy		sum of (265)…(271) =		6381.86	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		55.23	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
Printed on 10 October 2018 at 11:32:09

Project Information:

Assessed By:	Carlos Melgar (STRO031596)	**Building Type:**	Mid-terrace Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 116.75m²	
Site Reference :	Kings Mews Be Green	**Plot Reference:**	Plot 002
Address :	2, 10-11 Kings Mews, WC1N 2ES		

Client Details:

Name: James Taylor
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)	23.21 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.79 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.16 (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	0.16 (max. 0.20)	0.16 (max. 0.35)	**OK**
Openings	1.37 (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	2.50 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - electric Direct acting electric boiler
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 0.93 kWh/day	
	Permitted by DBSCG: 1.03 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services		OK
Hot water controls:	Cylinderstat		OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.69	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Slight	OK

Based on:

Overshading:	Average or unknown
Windows facing: South West	8.38m²
Windows facing: North East	6.07m²
Roof windows facing: Horizontal	9.22m²
Ventilation rate:	4.00
	Closed 0% of daylight hours

10 Key features

Air permeablility	2.5 m³/m²h
Doors U-value	1.09 W/m²K
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Photovoltaic array	

Predicted Energy Assessment

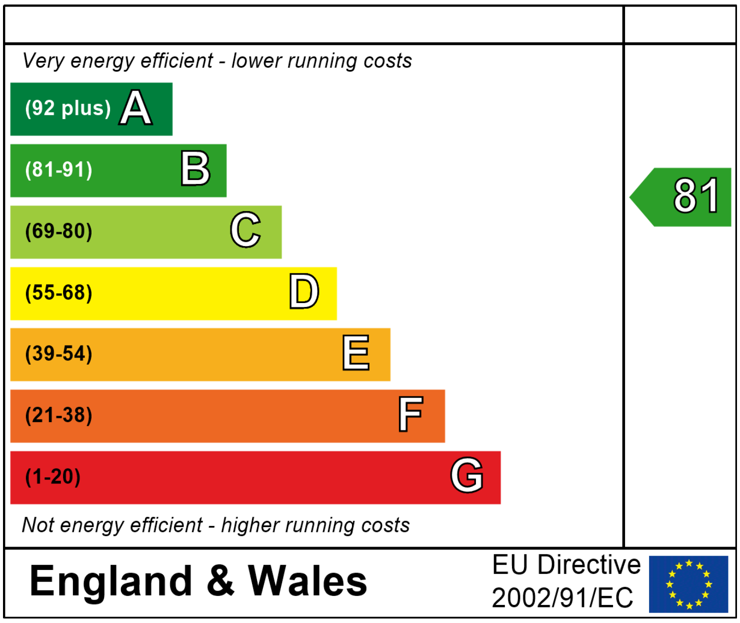
2
10-11 Kings Mews
WC1N 2ES

Dwelling type:	Mid-terrace Ground floor Flat
Date of assessment:	19 July 2018
Produced by:	Carlos Melgar
Total floor area:	116.75 m²

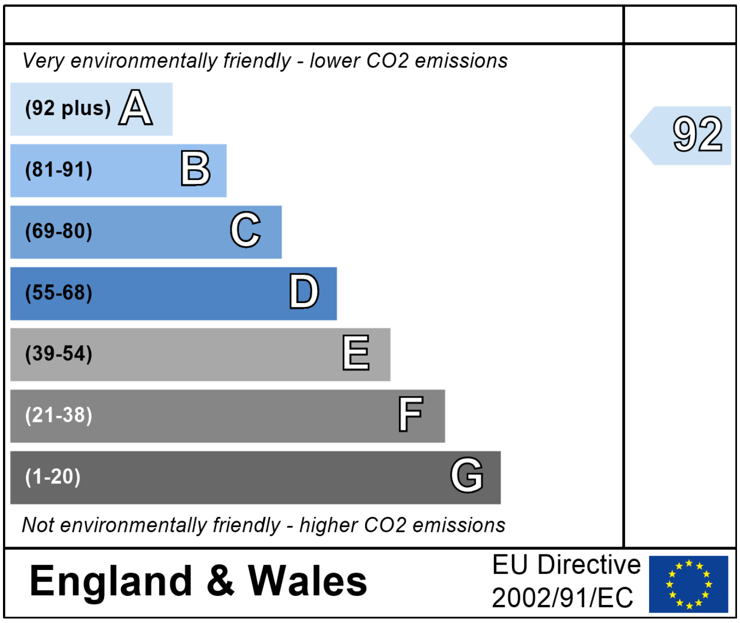
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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 carbonn 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:	Carlos Melgar	**Stroma Number:**	STRO031596
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.16

Property Address: Plot 002

Address : 2, 10-11 Kings Mews, WC1N 2ES

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	66.62	(1a)	x	2.41	(2a)	=	160.55	(3a)
First floor	50.13	(1b)	x	3	(2b)	=	150.39	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	116.75	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	310.94	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(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) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

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		0	(11)

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

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		2.5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.12	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.09	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

SAP WorkSheet: New dwelling design stage

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

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

0.11	0.11	0.11	0.1	0.09	0.08	0.08	0.08	0.09	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

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

(24a)m=	0.24	0.24	0.23	0.22	0.22	0.21	0.21	0.21	0.21	0.22	0.22	0.23	(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 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.24	0.24	0.23	0.22	0.22	0.21	0.21	0.21	0.21	0.22	0.22	0.23	(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	
Doors			2.1	x	1.09	=	2.289			(26)
Windows Type 1			8.38	x1/[1/(1.4)+ 0.04]		=	11.11			(27)
Windows Type 2			6.07	x1/[1/(1.4)+ 0.04]		=	8.05			(27)
Rooflights			9.22	x1/[1/(1.4) + 0.04]		=	12.908			(27b)
Floor			66.62	x	0.13	=	8.6606	110	7328.2	(28)
Walls Type1	29.01	14.45	14.56	x	0.16	=	2.33	49.5	720.72	(29)
Walls Type2	44.36	2.1	42.26	x	0.14	=	5.98	49.5	2091.87	(29)
Walls Type3	52.58	0	52.58	x	0.12	=	6.31	17	893.86	(29)
Roof Type1	11.44	9.22	2.22	x	0.16	=	0.36	9	19.98	(30)
Roof Type2	7.17	0	7.17	x	0.16	=	1.15	9	64.53	(30)
Total area of elements, m²			211.18							(31)
Party wall			107.15	x	0	=	0	49.5	5303.925	(32)
Party ceiling			50.13					100	5013	(32b)
Internal wall **			148.78					9	1339.02	(32c)
Internal floor			50.13					18	902.34	(32d)
Internal ceiling			50.13					9	451.17	(32e)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-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) = 58.45 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 24128.62 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 206.67 (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 15.61 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 74.06 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	24.38	24.15	23.93	22.81	22.58	21.46	21.46	21.23	21.91	22.58	23.03	23.48	(38)

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

(39)m=	98.44	98.21	97.99	96.86	96.64	95.52	95.52	95.29	95.97	96.64	97.09	97.54	

Average = $Sum(39)_{1…12}$ /12= 96.81 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.84	0.84	0.84	0.83	0.83	0.82	0.82	0.82	0.82	0.83	0.83	0.84

Average = $Sum(40)_{1…12}$ /12= 0.83 (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 2.85 (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) + 36 101.88 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	112.07	108	103.92	99.85	95.77	91.7	91.7	95.77	99.85	103.92	108	112.07

Total = $Sum(44)_{1…12}$ = 1222.6 (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=	166.2	145.36	150	130.77	125.48	108.28	100.34	115.14	116.51	135.78	148.22	160.96

Total = $Sum(45)_{1…12}$ = 1603.02 (45)

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

(46)m=	24.93	21.8	22.5	19.62	18.82	16.24	15.05	17.27	17.48	20.37	22.23	24.14	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 50 (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): 0.93 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.5 (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) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)	0.5	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	15.57	14.06	15.57	15.07	15.57	15.07	15.57	15.57	15.07	15.57	15.07	15.57	(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=	15.57	14.06	15.57	15.07	15.57	15.07	15.57	15.57	15.07	15.57	15.07	15.57	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	181.77	159.42	165.57	145.84	141.05	123.34	115.9	130.7	131.58	151.35	163.28	176.52	(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=	181.77	159.42	165.57	145.84	141.05	123.34	115.9	130.7	131.58	151.35	163.28	176.52	

Output from water heater (annual)$_{1…12}$ — 1786.33 — (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	67.72	59.58	62.33	55.53	54.18	48.06	45.82	50.74	50.79	57.6	61.34	65.97	(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=	170.99	170.99	170.99	170.99	170.99	170.99	170.99	170.99	170.99	170.99	170.99	170.99	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	69.02	61.3	49.86	37.74	28.21	23.82	25.74	33.45	44.9	57.01	66.54	70.94	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	419.28	423.63	412.67	389.33	359.87	332.17	313.67	309.32	320.29	343.63	373.09	400.78	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	54.95	54.95	54.95	54.95	54.95	54.95	54.95	54.95	54.95	54.95	54.95	54.95	(69)
Pumps and fans gains (Table 5a)													
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-113.99	-113.99	-113.99	-113.99	-113.99	-113.99	-113.99	-113.99	-113.99	-113.99	-113.99	-113.99	(71)
Water heating gains (Table 5)													
(72)m=	91.02	88.66	83.78	77.13	72.82	66.74	61.58	68.2	70.55	77.42	85.19	88.67	(72)

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

(73)m=	694.27	688.55	661.25	619.15	575.84	537.68	515.94	525.92	550.68	593.01	639.77	675.34	(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 m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	6.07	x	11.28	x	0.51	x	1.11	=	26.9	(75)
Northeast 0.9x	0.77	x	6.07	x	22.97	x	0.51	x	1.11	=	54.75	(75)
Northeast 0.9x	0.77	x	6.07	x	41.38	x	0.51	x	1.11	=	98.63	(75)
Northeast 0.9x	0.77	x	6.07	x	67.96	x	0.51	x	1.11	=	161.99	(75)
Northeast 0.9x	0.77	x	6.07	x	91.35	x	0.51	x	1.11	=	217.74	(75)
Northeast 0.9x	0.77	x	6.07	x	97.38	x	0.51	x	1.11	=	232.13	(75)
Northeast 0.9x	0.77	x	6.07	x	91.1	x	0.51	x	1.11	=	217.16	(75)
Northeast 0.9x	0.77	x	6.07	x	72.63	x	0.51	x	1.11	=	173.12	(75)
Northeast 0.9x	0.77	x	6.07	x	50.42	x	0.51	x	1.11	=	120.19	(75)
Northeast 0.9x	0.77	x	6.07	x	28.07	x	0.51	x	1.11	=	66.9	(75)
Northeast 0.9x	0.77	x	6.07	x	14.2	x	0.51	x	1.11	=	33.84	(75)
Northeast 0.9x	0.77	x	6.07	x	9.21	x	0.51	x	1.11	=	21.96	(75)
Southwest 0.9x	0.77	x	8.38	x	36.79		0.51	x	1.11	=	121.08	(79)
Southwest 0.9x	0.77	x	8.38	x	62.67		0.51	x	1.11	=	206.25	(79)
Southwest 0.9x	0.77	x	8.38	x	85.75		0.51	x	1.11	=	282.2	(79)
Southwest 0.9x	0.77	x	8.38	x	106.25		0.51	x	1.11	=	349.66	(79)
Southwest 0.9x	0.77	x	8.38	x	119.01		0.51	x	1.11	=	391.64	(79)
Southwest 0.9x	0.77	x	8.38	x	118.15		0.51	x	1.11	=	388.81	(79)
Southwest 0.9x	0.77	x	8.38	x	113.91		0.51	x	1.11	=	374.86	(79)
Southwest 0.9x	0.77	x	8.38	x	104.39		0.51	x	1.11	=	343.53	(79)
Southwest 0.9x	0.77	x	8.38	x	92.85		0.51	x	1.11	=	305.56	(79)
Southwest 0.9x	0.77	x	8.38	x	69.27		0.51	x	1.11	=	227.95	(79)
Southwest 0.9x	0.77	x	8.38	x	44.07		0.51	x	1.11	=	145.03	(79)
Southwest 0.9x	0.77	x	8.38	x	31.49		0.51	x	1.11	=	103.62	(79)
Rooflights 0.9x	1	x	9.22	x	26	x	0.6	x	0	=	143.83	(82)
Rooflights 0.9x	1	x	9.22	x	54	x	0.6	x	1.11	=	298.73	(82)
Rooflights 0.9x	1	x	9.22	x	96	x	0.6	x	1.11	=	531.07	(82)
Rooflights 0.9x	1	x	9.22	x	150	x	0.6	x	1.11	=	829.8	(82)
Rooflights 0.9x	1	x	9.22	x	192	x	0.6	x	1.11	=	1062.14	(82)
Rooflights 0.9x	1	x	9.22	x	200	x	0.6	x	1.11	=	1106.4	(82)
Rooflights 0.9x	1	x	9.22	x	189	x	0.6	x	1.11	=	1045.55	(82)
Rooflights 0.9x	1	x	9.22	x	157	x	0.6	x	1.11	=	868.52	(82)
Rooflights 0.9x	1	x	9.22	x	115	x	0.6	x	1.11	=	636.18	(82)
Rooflights 0.9x	1	x	9.22	x	66	x	0.6	x	1.11	=	365.11	(82)

Rooflights 0.9x	1	x	9.22	x	33	x	0.6	x	1.11	=	182.56	(82)
Rooflights 0.9x	1	x	9.22	x	21	x	0.6	x	1.11	=	116.17	(82)

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

(83)m=	291.81	559.72	911.9	1341.44	1671.53	1727.35	1637.56	1385.17	1061.93	659.96	361.43	241.76	(83)

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

(84)m=	986.07	1248.27	1573.15	1960.59	2247.37	2265.03	2153.5	1911.09	1612.61	1252.97	1001.19	917.1	(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	0.93	0.8	0.58	0.4	0.27	0.2	0.23	0.41	0.74	0.94	0.98	(86)

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

(87)m=	20.32	20.58	20.84	20.97	21	21	21	21	21	20.93	20.6	20.26	(87)

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

(88)m=	20.22	20.22	20.22	20.23	20.23	20.24	20.24	20.24	20.23	20.23	20.23	20.22	(88)

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

(89)m=	0.97	0.91	0.77	0.55	0.37	0.24	0.16	0.19	0.36	0.7	0.93	0.98	(89)

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

(90)m=	19.33	19.69	20.03	20.2	20.23	20.24	20.24	20.24	20.23	20.15	19.72	19.25	(90)

fLA = Living area ÷ (4) = 0.25 (91)

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

(92)m=	19.58	19.91	20.24	20.39	20.42	20.43	20.43	20.43	20.43	20.35	19.94	19.5	(92)

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

(93)m=	19.43	19.76	20.09	20.24	20.27	20.28	20.28	20.28	20.28	20.2	19.79	19.35	(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=	0.96	0.91	0.77	0.55	0.37	0.24	0.16	0.19	0.37	0.7	0.92	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	949.64	1129.9	1209.76	1079.74	826.36	542.36	351.46	369.79	591.3	876.09	922.61	891.75	(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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1488.94	1459.61	1331.36	1098.89	828.27	542.49	351.47	369.82	592.61	927.49	1232.41	1478.16	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	401.24	221.56	90.47	13.79	1.42	0	0	0	0	38.24	223.05	436.29	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1426.06 (98)

Space heating requirement in kWh/m²/year 12.21 (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		100	(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)	401.24	221.56	90.47	13.79	1.42	0	0	0	0	38.24	223.05	436.29		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	401.24	221.56	90.47	13.79	1.42	0	0	0	0	38.24	223.05	436.29		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1426.06	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)	181.77	159.42	165.57	145.84	141.05	123.34	115.9	130.7	131.58	151.35	163.28	176.52		
Efficiency of water heater													100	(216)
(217)m=	100	100	100	100	100	100	100	100	100	100	100	100		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	181.77	159.42	165.57	145.84	141.05	123.34	115.9	130.7	131.58	151.35	163.28	176.52		
Total = Sum(219a)$_{1...12}$ =													1786.33	(219)

Annual totals		kWh/year	kWh/year	
Space heating fuel used, main system 1			1426.06	
Water heating fuel used			1786.33	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		327.19		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		357.19	(231)
Electricity for lighting			487.57	(232)
Electricity generated by PVs			-2162.55	(233)

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 =	188.1	(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 =	235.62	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	47.11	(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 =	64.31	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	0	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			535.14	(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] =	1.39	(257)
SAP rating (Section 12)		80.62	(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	=	740.13	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	927.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1667.23	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	185.38	(267)
Electricity for lighting	(232) x	0.519	=	253.05	(268)
Energy saving/generation technologies Item 1		0.519	=	-1122.36	(269)
Total CO2, kg/year		sum of (265)…(271) =		983.3	(272)
CO2 emissions per m²		(272) ÷ (4) =		8.42	(273)
EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	4378.02	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	5484.02	(264)
Space and water heating	(261) + (262) + (263) + (264) =			9862.04	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	1096.58	(267)
Electricity for lighting	(232) x	0	=	1496.84	(268)
Energy saving/generation technologies Item 1		3.07	=	-6639.02	(269)
'Total Primary Energy		sum of (265)…(271) =		5816.44	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		49.82	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
Printed on 10 October 2018 at 11:31:55

Project Information:

Assessed By: Carlos Melgar (STRO031596) **Building Type:** Mid-Terrace Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 67.21m²

Site Reference : Kings Mews Be Green **Plot Reference:** Plot 003

Address : 3, 10-11 Kings Mews, WC1N 2ES

Client Details:

Name: James Taylor

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)	30.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	23.72 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	62.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.37 (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	2.50 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - electric
Direct acting electric boiler

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 0.93 kWh/day	
	Permitted by DBSCG: 1.03 kWh/day	OK
Primary pipework insulated:	Yes	OK

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services		OK
Hot water controls:	Cylinderstat		OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: South West	8.18m²
Windows facing: North East	11.23m²
Ventilation rate:	6.00
Blinds/curtains:	
	Closed 0% of daylight hours

10 Key features

Air permeablility	2.5 m³/m²h
Doors U-value	1.09 W/m²K
Party Walls U-value	0 W/m²K
Photovoltaic array	

Predicted Energy Assessment

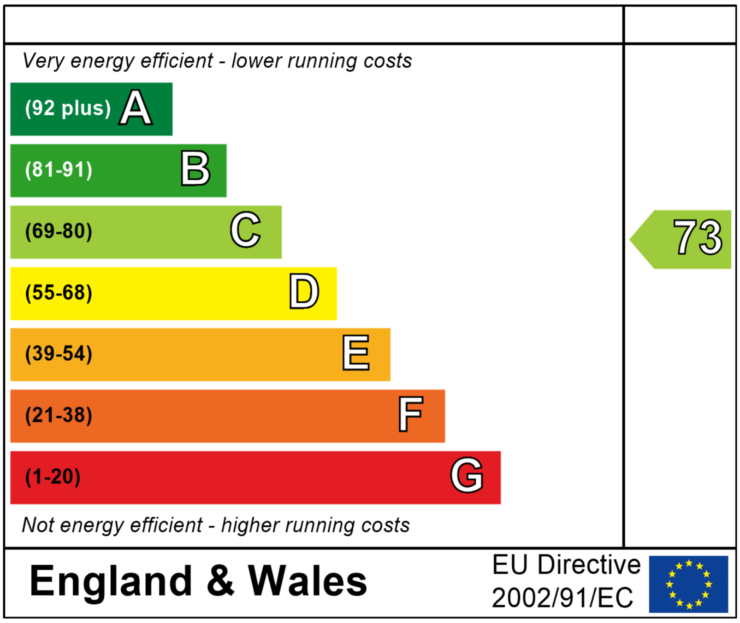
3
10-11 Kings Mews
WC1N 2ES

Dwelling type:	Mid-Terrace Mid floor Flat
Date of assessment:	19 July 2018
Produced by:	Carlos Melgar
Total floor area:	67.21 m²

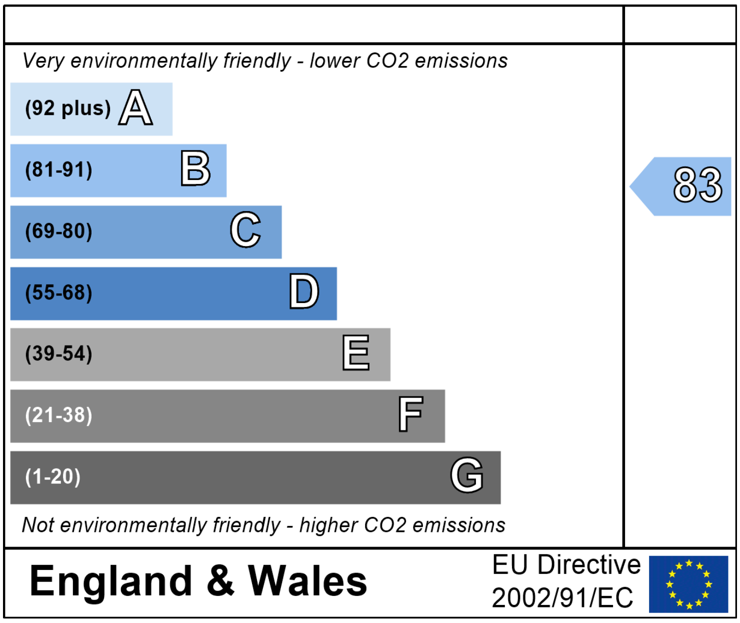
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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 carbonn 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:	Carlos Melgar	**Stroma Number:**	STRO031596
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.16

Property Address: Plot 003

Address : 3, 10-11 Kings Mews, WC1N 2ES

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	67.21	(1a)	x	2.42	(2a)	=	162.65	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	67.21	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			162.65	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(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) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

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		0	(11)

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

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		2.5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.12	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

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) =	0.12	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

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

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

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

0.16	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (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) × [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 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(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	
Doors			2.1	x	1.09	=	2.289			(26)
Windows Type 1			8.18	x1/[1/(1.4)+ 0.04]		=	10.84			(27)
Windows Type 2			11.23	x1/[1/(1.4)+ 0.04]		=	14.89			(27)
Floor Type 1			7.01	x	0.14	=	0.9814	75	525.75	(28)
Floor Type 2			8.43	x	0.14	=	1.1802	75	632.25	(28)
Walls Type1	49	19.41	29.59	x	0.16	=	4.73	49.5	1464.71	(29)
Walls Type2	21.38	2.1	19.28	x	0.14	=	2.73	49.5	954.36	(29)
Roof	31.3	0	31.3	x	0.16	=	5.01	9	281.7	(30)
Total area of elements, m²			117.12							(31)
Party wall			54.2	x	0	=	0	49.5	2682.9	(32)
Party ceiling			35.91					30	1077.3	(32b)
Internal wall **			85.76					9	771.84	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-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) = 42.65 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8390.81 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 124.84 (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 14.53 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

SAP WorkSheet: New dwelling design stage

Total fabric heat loss (33) + (36) = 57.18 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	26.84	26.84	26.84	26.84	26.84	26.84	26.84	26.84	26.84	26.84	26.84	26.84		(38)

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

(39)m=	84.02	84.02	84.02	84.02	84.02	84.02	84.02	84.02	84.02	84.02	84.02	84.02		
										Average = Sum(39)$_{1...12}$ /12=			84.02	(39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25		
										Average = Sum(40)$_{1...12}$ /12=			1.25	(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 2.18 (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 85.89 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(44)m=	94.48	91.05	87.61	84.17	80.74	77.3	77.3	80.74	84.17	87.61	91.05	94.48		
										Total = Sum(44)$_{1...12}$ =			1030.71	(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=	140.11	122.54	126.45	110.25	105.78	91.28	84.59	97.07	98.22	114.47	124.95	135.69		
										Total = Sum(45)$_{1...12}$ =			1351.43	(45)

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

(46)m=	21.02	18.38	18.97	16.54	15.87	13.69	12.69	14.56	14.73	17.17	18.74	20.35	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 50 (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): 0.93 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.5 (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) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.5 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	15.57	14.06	15.57	15.07	15.57	15.07	15.57	15.57	15.07	15.57	15.07	15.57	(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=	15.57	14.06	15.57	15.07	15.57	15.07	15.57	15.57	15.07	15.57	15.07	15.57	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	155.68	136.61	142.02	125.31	121.35	106.35	100.16	112.63	113.29	130.04	140.02	151.26	(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=	155.68	136.61	142.02	125.31	121.35	106.35	100.16	112.63	113.29	130.04	140.02	151.26	

Output from water heater (annual)1…12 | 1534.73 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	59.04	52	54.5	48.71	47.63	42.4	40.58	44.73	44.71	50.52	53.6	57.57	(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=	130.59	130.59	130.59	130.59	130.59	130.59	130.59	130.59	130.59	130.59	130.59	130.59	(66)

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

(67)m=	42.5	37.75	30.7	23.24	17.37	14.67	15.85	20.6	27.65	35.11	40.98	43.68	(67)

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

(68)m=	284.63	287.58	280.14	264.29	244.29	225.49	212.93	209.98	217.42	233.27	253.27	272.07	(68)

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

(69)m=	50.24	50.24	50.24	50.24	50.24	50.24	50.24	50.24	50.24	50.24	50.24	50.24	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-87.06	-87.06	-87.06	-87.06	-87.06	-87.06	-87.06	-87.06	-87.06	-87.06	-87.06	-87.06	(71)

Water heating gains (Table 5)

(72)m=	79.36	77.37	73.25	67.65	64.02	58.9	54.54	60.12	62.1	67.9	74.44	77.38	(72)

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

(73)m=	503.25	499.47	480.86	451.95	422.45	395.82	380.09	387.47	403.94	433.04	465.46	489.9	(73)

6. Solar gains:

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

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Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	11.23	x	11.28	x	0.51	x	1.11	=	49.76	(75)
Northeast 0.9x	0.77	x	11.23	x	22.97	x	0.51	x	1.11	=	101.28	(75)
Northeast 0.9x	0.77	x	11.23	x	41.38	x	0.51	x	1.11	=	182.48	(75)
Northeast 0.9x	0.77	x	11.23	x	67.96	x	0.51	x	1.11	=	299.69	(75)
Northeast 0.9x	0.77	x	11.23	x	91.35	x	0.51	x	1.11	=	402.84	(75)
Northeast 0.9x	0.77	x	11.23	x	97.38	x	0.51	x	1.11	=	429.47	(75)
Northeast 0.9x	0.77	x	11.23	x	91.1	x	0.51	x	1.11	=	401.76	(75)
Northeast 0.9x	0.77	x	11.23	x	72.63	x	0.51	x	1.11	=	320.29	(75)
Northeast 0.9x	0.77	x	11.23	x	50.42	x	0.51	x	1.11	=	222.36	(75)
Northeast 0.9x	0.77	x	11.23	x	28.07	x	0.51	x	1.11	=	123.78	(75)
Northeast 0.9x	0.77	x	11.23	x	14.2	x	0.51	x	1.11	=	62.61	(75)
Northeast 0.9x	0.77	x	11.23	x	9.21	x	0.51	x	1.11	=	40.63	(75)
Southwest 0.9x	0.77	x	8.18	x	36.79		0.51	x	1.11	=	118.19	(79)
Southwest 0.9x	0.77	x	8.18	x	62.67		0.51	x	1.11	=	201.33	(79)
Southwest 0.9x	0.77	x	8.18	x	85.75		0.51	x	1.11	=	275.46	(79)
Southwest 0.9x	0.77	x	8.18	x	106.25		0.51	x	1.11	=	341.31	(79)
Southwest 0.9x	0.77	x	8.18	x	119.01		0.51	x	1.11	=	382.3	(79)
Southwest 0.9x	0.77	x	8.18	x	118.15		0.51	x	1.11	=	379.53	(79)
Southwest 0.9x	0.77	x	8.18	x	113.91		0.51	x	1.11	=	365.91	(79)
Southwest 0.9x	0.77	x	8.18	x	104.39		0.51	x	1.11	=	335.33	(79)
Southwest 0.9x	0.77	x	8.18	x	92.85		0.51	x	1.11	=	298.27	(79)
Southwest 0.9x	0.77	x	8.18	x	69.27		0.51	x	1.11	=	222.51	(79)
Southwest 0.9x	0.77	x	8.18	x	44.07		0.51	x	1.11	=	141.57	(79)
Southwest 0.9x	0.77	x	8.18	x	31.49		0.51	x	1.11	=	101.15	(79)

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

(83)m=	167.95	302.61	457.94	641	785.13	809	767.67	655.62	520.62	346.28	204.18	141.78	(83)

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

(84)m=	671.2	802.08	938.8	1092.95	1207.58	1204.82	1147.76	1043.09	924.56	779.33	669.63	631.68	(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=	0.93	0.89	0.83	0.71	0.57	0.42	0.31	0.36	0.55	0.78	0.9	0.94	(86)

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

(87)m=	19.25	19.57	20.01	20.47	20.78	20.93	20.98	20.97	20.85	20.4	19.73	19.17	(87)

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

(88)m=	19.88	19.88	19.88	19.88	19.88	19.88	19.88	19.88	19.88	19.88	19.88	19.88	(88)

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

(89)m=	0.92	0.88	0.8	0.67	0.51	0.35	0.24	0.27	0.48	0.74	0.88	0.93	(89)

SAP WorkSheet: New dwelling design stage

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

(90)m=	17.61	18.06	18.66	19.27	19.66	19.83	19.87	19.86	19.75	19.21	18.29	17.48	(90)

fLA = Living area ÷ (4) = 0.49 (91)

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

(92)m=	18.42	18.8	19.32	19.86	20.21	20.37	20.41	20.41	20.29	19.8	19	18.31	(92)

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

(93)m=	18.27	18.65	19.17	19.71	20.06	20.22	20.26	20.26	20.14	19.65	18.85	18.16	(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=	0.9	0.86	0.78	0.67	0.52	0.37	0.26	0.3	0.5	0.73	0.86	0.91	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	605.04	687.22	736.85	730.5	630.79	451.63	302.49	315.84	461.35	569.7	577.75	576.63	(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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1173.64	1155.5	1064.9	908.19	702.44	472.07	307.82	323.91	507.31	760.33	987.34	1173.03	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	423.04	314.69	244.07	127.94	53.31	0	0	0	0	141.83	294.9	443.72	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2043.49 (98)

Space heating requirement in kWh/m²/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) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		100	(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)													
	423.04	314.69	244.07	127.94	53.31	0	0	0	0	141.83	294.9	443.72	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	423.04	314.69	244.07	127.94	53.31	0	0	0	0	141.83	294.9	443.72	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2043.49 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (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)

155.68	136.61	142.02	125.31	121.35	106.35	100.16	112.63	113.29	130.04	140.02	151.26

Efficiency of water heater 100 (216)

(217)m=	100	100	100	100	100	100	100	100	100	100	100	100	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	155.68	136.61	142.02	125.31	121.35	106.35	100.16	112.63	113.29	130.04	140.02	151.26

Total = Sum(219a)$_{1...12}$ = 1534.73 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2043.49	
Water heating fuel used			1534.73	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		48.03		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		78.03	(231)
Electricity for lighting			300.24	(232)
Electricity generated by PVs			-1244.92	(233)

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 =	269.54	(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 =	202.43	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	10.29	(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 =	39.6	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	0	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 521.86 (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] =	1.95	(257)
SAP rating (Section 12)		72.75	(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	=	1060.57	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)

Water heating	(219) x	0.519	=	796.52	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1857.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	40.5	(267)
Electricity for lighting	(232) x	0.519	=	155.83	(268)
Energy saving/generation technologies					
Item 1		0.519	=	-646.12	(269)
Total CO2, kg/year	sum of (265)…(271) =			1407.31	(272)
CO2 emissions per m²	(272) ÷ (4) =			20.94	(273)
EI rating (section 14)				83	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	6273.52	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	4711.62	(264)
Space and water heating	(261) + (262) + (263) + (264) =			10985.14	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	239.55	(267)
Electricity for lighting	(232) x	0	=	921.75	(268)
Energy saving/generation technologies					
Item 1		3.07	=	-3821.91	(269)
'Total Primary Energy	sum of (265)…(271) =			8324.52	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			123.86	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
Printed on 10 October 2018 at 11:31:42

Project Information:

Assessed By: Carlos Melgar (STRO031596) **Building Type:** Mid-terrace Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 54.34m²

Site Reference : Kings Mews Be Green **Plot Reference:** Plot 004

Address : 4, 10-11 Kings Mews, WC1N 2ES

Client Details:

Name: James Taylor

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)	29.24 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.15 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	**OK**
Openings	1.34 (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	2.50 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - electric Direct acting electric boiler	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 0.80 kWh/day	
	Permitted by DBSCG: 1.03 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	4.09m²	
Windows facing: North East	4.6m²	
Ventilation rate:	6.00	
	Closed 0% of daylight hours	

10 Key features

Air permeablility	2.5 m³/m²h
Doors U-value	1.09 W/m²K
Party Walls U-value	0 W/m²K
Photovoltaic array	

Predicted Energy Assessment

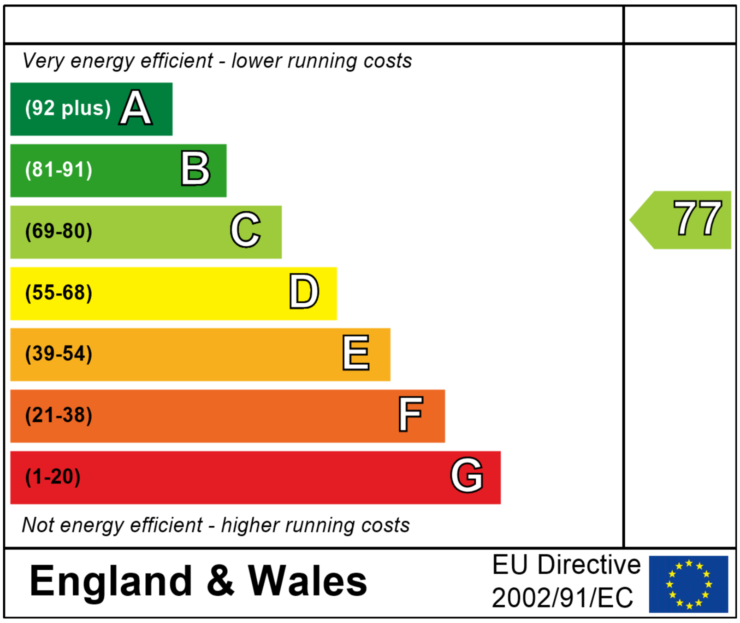
4
10-11 Kings Mews
WC1N 2ES

Dwelling type:	Mid-terrace Mid floor Flat
Date of assessment:	19 July 2018
Produced by:	Carlos Melgar
Total floor area:	54.34 m²

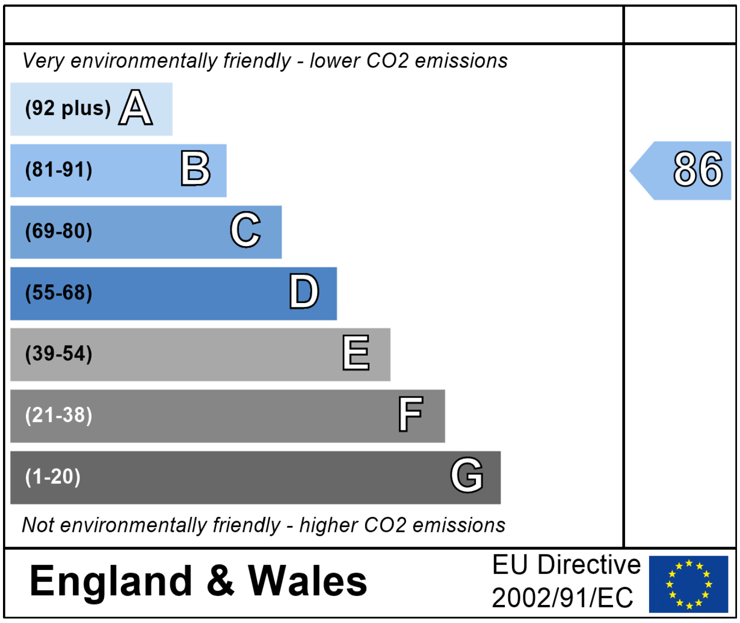
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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 carbonn 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:	Carlos Melgar	**Stroma Number:**	STRO031596
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.16

Property Address: Plot 004

Address : 4, 10-11 Kings Mews, WC1N 2ES

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	54.34	(1a) x	2.42	(2a) =	131.5	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	54.34	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		131.5	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(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) = 0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)			
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		0	(11)
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			
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		2.5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.12	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.11	(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

0.14	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.11	0.11	0.12	0.12

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (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) × [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 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(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	
Doors			2.1	x	1.09	=	2.289			(26)
Windows Type 1			4.09	x1/[1/(1.4)+ 0.04]		=	5.42			(27)
Windows Type 2			4.6	x1/[1/(1.4)+ 0.04]		=	6.1			(27)
Floor Type 1			3.76	x	0.14	=	0.5264	75	282	(28)
Floor Type 2			7.44	x	0.14	=	1.0416	75	558	(28)
Walls Type1	23.5	8.69	14.81	x	0.16	=	2.37	49.5	733.09	(29)
Walls Type2	21.14	2.1	19.04	x	0.14	=	2.69	49.5	942.48	(29)
Roof	17.03	0	17.03	x	0.16	=	2.72	9	153.27	(30)
Total area of elements, m²			72.87							(31)
Party wall			62.97	x	0	=	0	49.5	3117.015	(32)
Party ceiling			37.31					20	746.2	(32b)
Internal wall **			50.68					9	456.12	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-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) = 23.17 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6988.18 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 128.6 (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 11.05 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

SAP WorkSheet: New dwelling design stage

Total fabric heat loss (33) + (36) = 34.21 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	21.7	(38)

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

(39)m=	55.91	55.91	55.91	55.91	55.91	55.91	55.91	55.91	55.91	55.91	55.91	55.91	

Average = $Sum(39)_{1...12}$ /12= 55.91 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	

Average = $Sum(40)_{1...12}$ /12= 1.03 (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 1.82 (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 77.38 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	85.12	82.02	78.92	75.83	72.73	69.64	69.64	72.73	75.83	78.92	82.02	85.12	

Total = $Sum(44)_{1...12}$ = 928.53 (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=	126.22	110.4	113.92	99.32	95.3	82.23	76.2	87.44	88.49	103.12	112.57	122.24	

Total = $Sum(45)_{1...12}$ = 1217.45 (45)

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

(46)m=	18.93	16.56	17.09	14.9	14.29	12.34	11.43	13.12	13.27	15.47	16.89	18.34	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 50 (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): 0.8 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.43 (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) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.43 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	13.39	12.1	13.39	12.96	13.39	12.96	13.39	13.39	12.96	13.39	12.96	13.39	(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=	13.39	12.1	13.39	12.96	13.39	12.96	13.39	13.39	12.96	13.39	12.96	13.39	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	139.62	122.49	127.31	112.28	108.69	95.19	89.59	100.83	101.45	116.52	125.53	135.63	(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=	139.62	122.49	127.31	112.28	108.69	95.19	89.59	100.83	101.45	116.52	125.53	135.63

Output from water heater (annual)$_{1...12}$ | 1375.13 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	52.68	46.38	48.59	43.39	42.4	37.71	36.05	39.79	39.79	45	47.8	51.36	(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=	109.08	109.08	109.08	109.08	109.08	109.08	109.08	109.08	109.08	109.08	109.08	109.08	(66)

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

(67)m=	36.85	32.73	26.62	20.15	15.07	12.72	13.74	17.86	23.98	30.44	35.53	37.88	(67)

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

(68)m=	236.54	239	232.81	219.64	203.02	187.4	176.96	174.51	180.69	193.86	210.48	226.11	(68)

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

(69)m=	47.73	47.73	47.73	47.73	47.73	47.73	47.73	47.73	47.73	47.73	47.73	47.73	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-72.72	-72.72	-72.72	-72.72	-72.72	-72.72	-72.72	-72.72	-72.72	-72.72	-72.72	-72.72	(71)

Water heating gains (Table 5)

(72)m=	70.81	69.02	65.31	60.27	56.99	52.38	48.46	53.48	55.26	60.49	66.38	69.03	(72)

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

(73)m=	431.29	427.84	411.83	387.15	362.16	339.58	326.25	332.94	347.02	371.88	399.48	420.1	(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 m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	4.6	x	11.28	x	0.51	x	1.11	=	20.38	(75)
Northeast	0.9x	0.77	x	4.6	x	22.97	x	0.51	x	1.11	=	41.49	(75)
Northeast	0.9x	0.77	x	4.6	x	41.38	x	0.51	x	1.11	=	74.75	(75)
Northeast	0.9x	0.77	x	4.6	x	67.96	x	0.51	x	1.11	=	122.76	(75)
Northeast	0.9x	0.77	x	4.6	x	91.35	x	0.51	x	1.11	=	165.01	(75)
Northeast	0.9x	0.77	x	4.6	x	97.38	x	0.51	x	1.11	=	175.92	(75)
Northeast	0.9x	0.77	x	4.6	x	91.1	x	0.51	x	1.11	=	164.57	(75)
Northeast	0.9x	0.77	x	4.6	x	72.63	x	0.51	x	1.11	=	131.19	(75)
Northeast	0.9x	0.77	x	4.6	x	50.42	x	0.51	x	1.11	=	91.08	(75)
Northeast	0.9x	0.77	x	4.6	x	28.07	x	0.51	x	1.11	=	50.7	(75)
Northeast	0.9x	0.77	x	4.6	x	14.2	x	0.51	x	1.11	=	25.65	(75)
Northeast	0.9x	0.77	x	4.6	x	9.21	x	0.51	x	1.11	=	16.64	(75)
Southwest	0.9x	0.77	x	4.09	x	36.79		0.51	x	1.11	=	59.1	(79)
Southwest	0.9x	0.77	x	4.09	x	62.67		0.51	x	1.11	=	100.66	(79)
Southwest	0.9x	0.77	x	4.09	x	85.75		0.51	x	1.11	=	137.73	(79)
Southwest	0.9x	0.77	x	4.09	x	106.25		0.51	x	1.11	=	170.66	(79)
Southwest	0.9x	0.77	x	4.09	x	119.01		0.51	x	1.11	=	191.15	(79)
Southwest	0.9x	0.77	x	4.09	x	118.15		0.51	x	1.11	=	189.77	(79)
Southwest	0.9x	0.77	x	4.09	x	113.91		0.51	x	1.11	=	182.95	(79)
Southwest	0.9x	0.77	x	4.09	x	104.39		0.51	x	1.11	=	167.67	(79)
Southwest	0.9x	0.77	x	4.09	x	92.85		0.51	x	1.11	=	149.13	(79)
Southwest	0.9x	0.77	x	4.09	x	69.27		0.51	x	1.11	=	111.25	(79)
Southwest	0.9x	0.77	x	4.09	x	44.07		0.51	x	1.11	=	70.78	(79)
Southwest	0.9x	0.77	x	4.09	x	31.49		0.51	x	1.11	=	50.57	(79)

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

(83)m=	79.48	142.15	212.48	293.41	356.16	365.68	347.52	298.86	240.21	161.95	96.43	67.22	(83)

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

(84)m=	510.77	569.99	624.31	680.56	718.32	705.26	673.77	631.8	587.23	533.83	495.91	487.32	(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=	0.93	0.91	0.86	0.77	0.63	0.48	0.36	0.39	0.59	0.8	0.9	0.94	(86)

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

(87)m=	19.67	19.88	20.2	20.55	20.81	20.94	20.98	20.98	20.89	20.55	20.04	19.6	(87)

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

(88)m=	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	(88)

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

(89)m=	0.92	0.89	0.84	0.73	0.59	0.42	0.28	0.32	0.53	0.76	0.89	0.93	(89)

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

(90)m=	18.32	18.62	19.05	19.53	19.86	20.01	20.05	20.05	19.96	19.54	18.85	18.22		(90)
											fLA = Living area ÷ (4) =		0.51	(91)

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

(92)m=	19.01	19.27	19.64	20.05	20.35	20.49	20.53	20.52	20.43	20.06	19.46	18.93	(92)

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

(93)m=	18.86	19.12	19.49	19.9	20.2	20.34	20.38	20.37	20.28	19.91	19.31	18.78	(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=	0.91	0.88	0.82	0.73	0.59	0.44	0.31	0.34	0.54	0.76	0.87	0.92		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	463.93	499.71	513.62	495.49	426.04	307.67	208.24	217.67	318.44	404.94	433.1	447.37		(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, Lm , W =[(39)m x [(93)m– (96)m]														
(97)m=	814.25	794.99	726.46	615.22	475.2	320.99	211.37	222.23	345.8	520.68	682.92	815.24		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	260.64	198.42	158.35	86.21	36.57	0	0	0	0	86.11	179.87	273.7		
											Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ =		1279.88	(98)
Space heating requirement in kWh/m²/year													23.55	(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		100	(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)														
	260.64	198.42	158.35	86.21	36.57	0	0	0	0	86.11	179.87	273.7		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	260.64	198.42	158.35	86.21	36.57	0	0	0	0	86.11	179.87	273.7		
											Total (kWh/year) =$Sum(211)_{1...5,10...12}$=		1279.88	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (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)														
	139.62	122.49	127.31	112.28	108.69	95.19	89.59	100.83	101.45	116.52	125.53	135.63		
Efficiency of water heater													100	(216)

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(217)m=	100	100	100	100	100	100	100	100	100	100	100	100	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	139.62	122.49	127.31	112.28	108.69	95.19	89.59	100.83	101.45	116.52	125.53	135.63

Total = Sum(219a)$_{1...12}$ = 1375.13 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1279.88	
Water heating fuel used			1375.13	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		39.63		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		69.63	(231)
Electricity for lighting			260.35	(232)
Electricity generated by PVs			-1006.53	(233)

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 =	168.82	(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 =	181.38	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.18	(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 =	34.34	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	0	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 393.72 (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] =	1.66	(257)
SAP rating (Section 12)		76.78	(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	=	664.26	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)

Water heating	(219) x	0.519	=	713.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1377.95	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	36.14	(267)
Electricity for lighting	(232) x	0.519	=	135.12	(268)
Energy saving/generation technologies					
Item 1		0.519	=	-522.39	(269)
Total CO2, kg/year	sum of (265)…(271) =			1026.82	(272)
CO2 emissions per m²	(272) ÷ (4) =			18.9	(273)
EI rating (section 14)				86	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	3929.24	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	4221.64	(264)
Space and water heating	(261) + (262) + (263) + (264) =			8150.89	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	213.76	(267)
Electricity for lighting	(232) x	0	=	799.26	(268)
Energy saving/generation technologies					
Item 1		3.07	=	-3090.06	(269)
‘Total Primary Energy	sum of (265)…(271) =			6073.84	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			111.77	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.16
Printed on 10 October 2018 at 11:31:28

Project Information:

Assessed By:	Carlos Melgar (STRO031596)	**Building Type:**	Semi-detached Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 76.95m²	
Site Reference :	Kings Mews Be Green	**Plot Reference:**	Plot 005
Address :	5, 10-11 Kings Mews, WC1N 2ES		

Client Details:

Name: James Taylor

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)	28.95 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.46 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	**OK**
Openings	1.37 (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	2.50 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - electric Direct acting electric boiler
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 0.80 kWh/day	
	Permitted by DBSCG: 1.03 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	7.64m²
Windows facing: North East	0.9m²
Windows facing: North East	12.39m²
Ventilation rate:	6.00
	Closed 0% of daylight hours

10 Key features

Air permeablility	2.5 m³/m²h
Doors U-value	1.09 W/m²K
Party Walls U-value	0 W/m²K
Photovoltaic array	

Predicted Energy Assessment

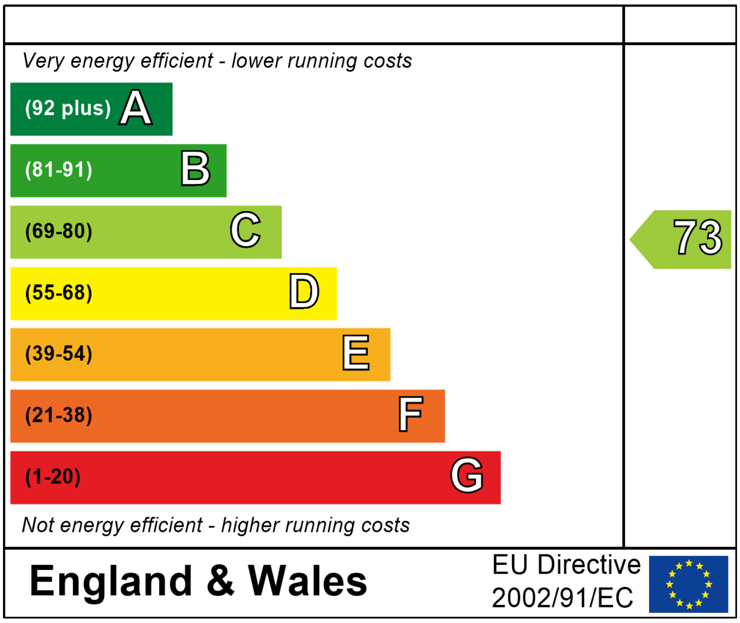
5
10-11 Kings Mews
WC1N 2ES

Dwelling type:	Semi-detached Top floor Flat
Date of assessment:	19 July 2018
Produced by:	Carlos Melgar
Total floor area:	76.95 m²

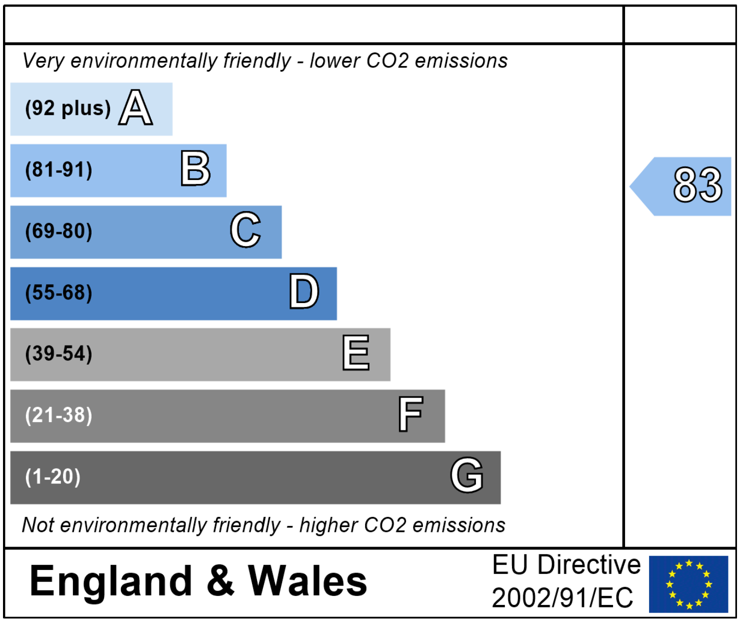
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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 carbonn 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:	Carlos Melgar	**Stroma Number:**	STRO031596
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.16

Property Address: Plot 005

Address : 5, 10-11 Kings Mews, WC1N 2ES

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	76.95	(1a)	x	2.26	(2a)	=	173.91	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.95	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			173.91	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(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) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

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		0	(11)
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			
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		2.5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.12	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.11	(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

0.14	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.11	0.11	0.12	0.12

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (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) × [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 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(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	
Doors			2.1	x	1.09	=	2.289			(26)
Windows Type 1			7.64	x1/[1/(1.4)+ 0.04]		=	10.13			(27)
Windows Type 2			0.9	x1/[1/(1.4)+ 0.04]		=	1.19			(27)
Windows Type 3			12.39	x1/[1/(1.4)+ 0.04]		=	16.43			(27)
Floor			2.37	x	0.14	=	0.3318	75	177.75	(28)
Walls Type1	66.68	20.93	45.75	x	0.16	=	7.32	49.5	2264.63	(29)
Walls Type2	33.62	2.1	31.52	x	0.14	=	4.46	49.5	1560.24	(29)
Roof	76.95	0	76.95	x	0.16	=	12.31	9	692.55	(30)
Total area of elements, m²			179.62							(31)
Party wall			24.54	x	0	=	0	49.5	1214.73	(32)
Party floor			74.58					40	2983.2	(32a)
Internal wall **			98.92					9	890.28	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-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) = 54.46 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9783.38 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 127.14 (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 10.49 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 64.94 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	28.69	28.69	28.69	28.69	28.69	28.69	28.69	28.69	28.69	28.69	28.69	28.69	(38)

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

(39)m=	93.64	93.64	93.64	93.64	93.64	93.64	93.64	93.64	93.64	93.64	93.64	93.64	

Average = $Sum(39)_{1...12}$ /12= 93.64 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	

Average = $Sum(40)_{1...12}$ /12= 1.22 (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 2.4 (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 91.26 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	100.38	96.73	93.08	89.43	85.78	82.13	82.13	85.78	89.43	93.08	96.73	100.38

Total = $Sum(44)_{1...12}$ = 1095.1 (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=	148.87	130.2	134.35	117.13	112.39	96.99	89.87	103.13	104.36	121.62	132.76	144.17

Total = $Sum(45)_{1...12}$ = 1435.84 (45)

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

(46)m=	22.33	19.53	20.15	17.57	16.86	14.55	13.48	15.47	15.65	18.24	19.91	21.63	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 50 (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): 0.8 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.43 (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) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.43 (55)

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Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	13.39	12.1	13.39	12.96	13.39	12.96	13.39	13.39	12.96	13.39	12.96	13.39	(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=	13.39	12.1	13.39	12.96	13.39	12.96	13.39	13.39	12.96	13.39	12.96	13.39	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	162.26	142.3	147.75	130.09	125.78	109.95	103.26	116.52	117.32	135.01	145.72	157.56	(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=	162.26	142.3	147.75	130.09	125.78	109.95	103.26	116.52	117.32	135.01	145.72	157.56

Output from water heater (annual) $_{1...12}$ | 1593.52 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	60.21	52.97	55.39	49.31	48.08	42.62	40.6	45	45.07	51.15	54.51	58.65	(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=	144.15	144.15	144.15	144.15	144.15	144.15	144.15	144.15	144.15	144.15	144.15	144.15	(66)

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

(67)m=	47.46	42.15	34.28	25.95	19.4	16.38	17.7	23	30.88	39.21	45.76	48.78	(67)

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

(68)m=	317.83	321.13	312.82	295.13	272.79	251.8	237.78	234.48	242.79	260.48	282.82	303.81	(68)

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

(69)m=	51.82	51.82	51.82	51.82	51.82	51.82	51.82	51.82	51.82	51.82	51.82	51.82	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-96.1	-96.1	-96.1	-96.1	-96.1	-96.1	-96.1	-96.1	-96.1	-96.1	-96.1	-96.1	(71)

Water heating gains (Table 5)

(72)m=	80.93	78.82	74.44	68.49	64.63	59.19	54.56	60.49	62.59	68.75	75.71	78.83	(72)

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

(73)m=	549.09	544.97	524.41	492.44	459.69	430.23	412.91	420.84	439.13	471.31	507.15	534.29	(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 m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	0.9	x	11.28	x	0.51	x	1.11	=	3.99	(75)
Northeast	0.9x	0.77	x	12.39	x	11.28	x	0.51	x	1.11	=	54.9	(75)
Northeast	0.9x	0.77	x	0.9	x	22.97	x	0.51	x	1.11	=	8.12	(75)
Northeast	0.9x	0.77	x	12.39	x	22.97	x	0.51	x	1.11	=	111.75	(75)
Northeast	0.9x	0.77	x	0.9	x	41.38	x	0.51	x	1.11	=	14.62	(75)
Northeast	0.9x	0.77	x	12.39	x	41.38	x	0.51	x	1.11	=	201.33	(75)
Northeast	0.9x	0.77	x	0.9	x	67.96	x	0.51	x	1.11	=	24.02	(75)
Northeast	0.9x	0.77	x	12.39	x	67.96	x	0.51	x	1.11	=	330.64	(75)
Northeast	0.9x	0.77	x	0.9	x	91.35	x	0.51	x	1.11	=	32.28	(75)
Northeast	0.9x	0.77	x	12.39	x	91.35	x	0.51	x	1.11	=	444.45	(75)
Northeast	0.9x	0.77	x	0.9	x	97.38	x	0.51	x	1.11	=	34.42	(75)
Northeast	0.9x	0.77	x	12.39	x	97.38	x	0.51	x	1.11	=	473.83	(75)
Northeast	0.9x	0.77	x	0.9	x	91.1	x	0.51	x	1.11	=	32.2	(75)
Northeast	0.9x	0.77	x	12.39	x	91.1	x	0.51	x	1.11	=	443.26	(75)
Northeast	0.9x	0.77	x	0.9	x	72.63	x	0.51	x	1.11	=	25.67	(75)
Northeast	0.9x	0.77	x	12.39	x	72.63	x	0.51	x	1.11	=	353.37	(75)
Northeast	0.9x	0.77	x	0.9	x	50.42	x	0.51	x	1.11	=	17.82	(75)
Northeast	0.9x	0.77	x	12.39	x	50.42	x	0.51	x	1.11	=	245.32	(75)
Northeast	0.9x	0.77	x	0.9	x	28.07	x	0.51	x	1.11	=	9.92	(75)
Northeast	0.9x	0.77	x	12.39	x	28.07	x	0.51	x	1.11	=	136.56	(75)
Northeast	0.9x	0.77	x	0.9	x	14.2	x	0.51	x	1.11	=	5.02	(75)
Northeast	0.9x	0.77	x	12.39	x	14.2	x	0.51	x	1.11	=	69.08	(75)
Northeast	0.9x	0.77	x	0.9	x	9.21	x	0.51	x	1.11	=	3.26	(75)
Northeast	0.9x	0.77	x	12.39	x	9.21	x	0.51	x	1.11	=	44.83	(75)
Southwest	0.9x	0.77	x	7.64	x	36.79		0.51	x	1.11	=	110.39	(79)
Southwest	0.9x	0.77	x	7.64	x	62.67		0.51	x	1.11	=	188.03	(79)
Southwest	0.9x	0.77	x	7.64	x	85.75		0.51	x	1.11	=	257.28	(79)
Southwest	0.9x	0.77	x	7.64	x	106.25		0.51	x	1.11	=	318.78	(79)
Southwest	0.9x	0.77	x	7.64	x	119.01		0.51	x	1.11	=	357.06	(79)
Southwest	0.9x	0.77	x	7.64	x	118.15		0.51	x	1.11	=	354.48	(79)
Southwest	0.9x	0.77	x	7.64	x	113.91		0.51	x	1.11	=	341.75	(79)
Southwest	0.9x	0.77	x	7.64	x	104.39		0.51	x	1.11	=	313.2	(79)
Southwest	0.9x	0.77	x	7.64	x	92.85		0.51	x	1.11	=	278.58	(79)
Southwest	0.9x	0.77	x	7.64	x	69.27		0.51	x	1.11	=	207.82	(79)
Southwest	0.9x	0.77	x	7.64	x	44.07		0.51	x	1.11	=	132.22	(79)
Southwest	0.9x	0.77	x	7.64	x	31.49		0.51	x	1.11	=	94.47	(79)

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

(83)m=	169.28	307.9	473.23	673.44	833.79	862.72	817.21	692.23	541.72	354.3	206.31	142.56	(83)

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

(84)m=	718.37	852.87	997.65	1165.88	1293.48	1292.96	1230.11	1113.07	980.85	825.61	713.47	676.85	(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=	0.94	0.91	0.85	0.74	0.59	0.44	0.33	0.37	0.58	0.8	0.91	0.95	(86)

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

(87)m=	19.26	19.57	20	20.46	20.78	20.93	20.98	20.97	20.84	20.39	19.73	19.18	(87)

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

(88)m=	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	(88)

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

(89)m=	0.93	0.89	0.82	0.7	0.53	0.37	0.25	0.29	0.51	0.77	0.9	0.94	(89)

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

(90)m=	17.64	18.07	18.67	19.29	19.68	19.85	19.89	19.89	19.77	19.22	18.31	17.52	(90)

fLA = Living area ÷ (4) = | 0.43 | (91)

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

(92)m=	18.34	18.71	19.24	19.79	20.16	20.32	20.36	20.35	20.23	19.73	18.92	18.23	(92)

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

(93)m=	18.19	18.56	19.09	19.64	20.01	20.17	20.21	20.2	20.08	19.58	18.77	18.08	(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=	0.91	0.87	0.8	0.69	0.54	0.39	0.27	0.31	0.52	0.75	0.88	0.92	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	656	744.38	802.48	802.71	697.2	499.06	332.64	347.5	508.03	621.26	626.33	625.11	(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, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1300.59	1279.35	1178.87	1005.88	777.78	521.32	338.22	356.14	560.22	840.51	1092.82	1300.17	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	479.57	359.5	280.04	146.28	59.95	0	0	0	0	163.12	335.88	502.25	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = | 2326.59 | (98)

Space heating requirement in kWh/m²/year | 30.24 | (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		100	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		kWh/year	
Space heating requirement (calculated above)	479.57	359.5	280.04	146.28	59.95	0	0	0	0	163.12	335.88	502.25			
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	479.57	359.5	280.04	146.28	59.95	0	0	0	0	163.12	335.88	502.25			(211)
													Total (kWh/year) =Sum(211)$_{1...5,10...12}$=	2326.59	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		kWh/year	
Output from water heater (calculated above)	162.26	142.3	147.75	130.09	125.78	109.95	103.26	116.52	117.32	135.01	145.72	157.56			
Efficiency of water heater														100	(216)
(217)m=	100	100	100	100	100	100	100	100	100	100	100	100			(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m															
(219)m=	162.26	142.3	147.75	130.09	125.78	109.95	103.26	116.52	117.32	135.01	145.72	157.56			
													Total = Sum(219a)$_{1...12}$ =	1593.52	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2326.59	
Water heating fuel used			1593.52	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		51.35		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		81.35	(231)
Electricity for lighting			335.27	(232)
Electricity generated by PVs			-1425.34	(233)

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 =	306.88	(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 =	210.19	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	10.73	(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 =	44.22	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	0	(252)

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Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost	(245)...(247) + (250)…(254) =	572.02	(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] =	1.97	(257)
SAP rating (Section 12)		72.52	(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	=	1207.5	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	827.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2034.54	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	42.22	(267)
Electricity for lighting	(232) x	0.519	=	174.01	(268)
Energy saving/generation technologies					
Item 1		0.519	=	-739.75	(269)
Total CO2, kg/year		sum of (265)…(271) =		1511.02	(272)
CO2 emissions per m²		(272) ÷ (4) =		19.64	(273)
EI rating (section 14)				83	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	7142.63	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	4892.12	(264)
Space and water heating	(261) + (262) + (263) + (264) =			12034.75	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	249.76	(267)
Electricity for lighting	(232) x	0	=	1029.29	(268)
Energy saving/generation technologies					
Item 1		3.07	=	-4375.78	(269)
‘Total Primary Energy		sum of (265)…(271) =		8938.01	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		116.15	(273)