Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
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Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 100.05m²

Site Reference : 11-12 Grenville Street - GREEN **Plot Reference:** Unit 1

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	25.97 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	20.45 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	71.5 kWh/m²	
		Fail

Excess energy = 15.49 kg/m² (27.7 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	4.37 (max. 2.00)	5.30 (max. 3.30)	Fail

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Heat pumps with radiators or underfloor heating - electric
Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 1.47 kWh/day
Permitted by DBSCG: 2.10 kWh/day OK

Regulations Compliance Report

Primary pipework insulated:	Yes		**OK**

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	Cylinderstat	**OK**
	Independent timer for DHW	**OK**
Boiler interlock:	Yes	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: South East	9.44m²
Windows facing: South West	3.39m²
Windows facing: North West	2.08m²
Roof windows facing: North West	1.85m²
Ventilation rate:	4.00

10 Key features

Party Walls U-value	0 W/m²K

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Unit 1

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Basement	32.47	(1a)	x	2.4	(2a)	=	77.93	(3a)
Ground floor	33.79	(1b)	x	2.8	(2b)	=	94.61	(3b)
First floor	33.79	(1c)	x	3.45	(2c)	=	116.58	(3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	100.05	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	289.12	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.1	(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		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.35	(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) =	0.35	(21)

Infiltration rate modified for monthly wind speed

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

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

DER 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

0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [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	0	0	0	0	0	0	0	0	0	0	0	(24c)

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.71	x	1.4	=	3.794			(26)
Windows Type 1			9.44	x1/[1/(4.8)+ 0.04]		=	38.01			(27)
Windows Type 2			3.39	x1/[1/(4.8)+ 0.04]		=	13.65			(27)
Windows Type 3			2.08	x1/[1/(4.8)+ 0.04]		=	8.38			(27)
Rooflights			1.85	x1/[1/(5.3) + 0.04]		=	9.805			(27b)
Floor			32.47	x	0.14	=	4.5458	110	3571.7	(28)
Walls Type1	40.6	0	40.6	x	0.15	=	6.09	9	365.4	(29)
Walls Type2	99.08	17.62	81.46	x	0.15	=	12.22	60	4887.6	(29)
Roof	36.46	1.85	34.61	x	0.14	=	4.85	9	311.49	(30)
Total area of elements, m²			208.61							(31)
Party wall			52.37	x	0	=	0	45	2356.65	(32)
Internal wall **			180.98					75	13573.5	(32c)
Internal floor			67.58					18	1216.44	(32d)
Internal ceiling			67.58					9	608.22	(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) = 99.62 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 26891 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 268.78 (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 — 15.01 (36)

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

Total fabric heat loss — (33) + (36) = 114.63 (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=	57.41	57.03	56.66	54.93	54.6	53.09	53.09	52.81	53.67	54.6	55.26	55.95	(38)

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

(39)m=	172.04	171.67	171.3	169.56	169.24	167.73	167.73	167.45	168.31	169.24	169.89	170.58

Average = Sum(39)$_{1…12}$ /12= 169.56 (39)

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

(40)m=	1.72	1.72	1.71	1.69	1.69	1.68	1.68	1.67	1.68	1.69	1.7	1.7

Average = Sum(40)$_{1…12}$ /12= 1.69 (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 — 2.74 (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 — 99.27 (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=	109.2	105.23	101.26	97.29	93.32	89.35	89.35	93.32	97.29	101.26	105.23	109.2

Total = Sum(44)$_{1…12}$ = 1191.3 (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=	161.94	141.64	146.16	127.42	122.27	105.51	97.77	112.19	113.53	132.31	144.42	156.83

Total = Sum(45)$_{1…12}$ = 1561.98 (45)

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

(46)m=	24.29	21.25	21.92	19.11	18.34	15.83	14.66	16.83	17.03	19.85	21.66	23.53	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.47 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.79 (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)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = | 0 | (54)

Enter (50) or (54) in (55) | 0.79 | (55)

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

(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(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=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(57)

Primary circuit loss (annual) from Table 3 | 0 | (58)

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

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

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

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

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

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

(62)m=	209.81	184.87	194.03	173.75	170.14	151.83	145.64	160.06	159.85	180.18	190.75	204.7	(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=	209.81	184.87	194.03	173.75	170.14	151.83	145.64	160.06	159.85	180.18	190.75	204.7

Output from water heater (annual)$_{1...12}$ | 2125.61 | (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=	92.14	81.68	86.89	79.43	78.95	72.14	70.8	75.6	74.81	82.29	85.08	90.44	(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=	137	137	137	137	137	137	137	137	137	137	137	137	(66)

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

(67)m=	23.12	20.53	16.7	12.64	9.45	7.98	8.62	11.21	15.04	19.1	22.29	23.76	(67)

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

(68)m=	256.41	259.07	252.36	238.09	220.07	203.14	191.82	189.16	195.87	210.14	228.16	245.1	(68)

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

(69)m=	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	(71)

Water heating gains (Table 5)

(72)m=	123.85	121.55	116.79	110.32	106.11	100.2	95.17	101.61	103.9	110.6	118.17	121.56	(72)

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

(73)m=	467.47	465.26	449.96	425.15	399.74	375.41	359.71	366.08	378.91	403.94	432.72	454.52	(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast	0.9x	0.77	x	9.44	x	36.79	x	0.85	x	0.7	=	143.22	(77)
Southeast	0.9x	0.77	x	9.44	x	62.67	x	0.85	x	0.7	=	243.95	(77)
Southeast	0.9x	0.77	x	9.44	x	85.75	x	0.85	x	0.7	=	333.79	(77)
Southeast	0.9x	0.77	x	9.44	x	106.25	x	0.85	x	0.7	=	413.58	(77)
Southeast	0.9x	0.77	x	9.44	x	119.01	x	0.85	x	0.7	=	463.24	(77)
Southeast	0.9x	0.77	x	9.44	x	118.15	x	0.85	x	0.7	=	459.89	(77)
Southeast	0.9x	0.77	x	9.44	x	113.91	x	0.85	x	0.7	=	443.39	(77)
Southeast	0.9x	0.77	x	9.44	x	104.39	x	0.85	x	0.7	=	406.33	(77)
Southeast	0.9x	0.77	x	9.44	x	92.85	x	0.85	x	0.7	=	361.42	(77)
Southeast	0.9x	0.77	x	9.44	x	69.27	x	0.85	x	0.7	=	269.62	(77)
Southeast	0.9x	0.77	x	9.44	x	44.07	x	0.85	x	0.7	=	171.54	(77)
Southeast	0.9x	0.77	x	9.44	x	31.49	x	0.85	x	0.7	=	122.56	(77)
Southwest	0.9x	0.77	x	3.39	x	36.79		0.85	x	0.7	=	51.43	(79)
Southwest	0.9x	0.77	x	3.39	x	62.67		0.85	x	0.7	=	87.61	(79)
Southwest	0.9x	0.77	x	3.39	x	85.75		0.85	x	0.7	=	119.87	(79)
Southwest	0.9x	0.77	x	3.39	x	106.25		0.85	x	0.7	=	148.52	(79)
Southwest	0.9x	0.77	x	3.39	x	119.01		0.85	x	0.7	=	166.35	(79)
Southwest	0.9x	0.77	x	3.39	x	118.15		0.85	x	0.7	=	165.15	(79)
Southwest	0.9x	0.77	x	3.39	x	113.91		0.85	x	0.7	=	159.22	(79)
Southwest	0.9x	0.77	x	3.39	x	104.39		0.85	x	0.7	=	145.92	(79)
Southwest	0.9x	0.77	x	3.39	x	92.85		0.85	x	0.7	=	129.79	(79)
Southwest	0.9x	0.77	x	3.39	x	69.27		0.85	x	0.7	=	96.82	(79)
Southwest	0.9x	0.77	x	3.39	x	44.07		0.85	x	0.7	=	61.6	(79)
Southwest	0.9x	0.77	x	3.39	x	31.49		0.85	x	0.7	=	44.01	(79)
Northwest	0.9x	0.77	x	2.08	x	11.28	x	0.85	x	0.7	=	9.68	(81)
Northwest	0.9x	0.77	x	2.08	x	22.97	x	0.85	x	0.7	=	19.7	(81)
Northwest	0.9x	0.77	x	2.08	x	41.38	x	0.85	x	0.7	=	35.49	(81)
Northwest	0.9x	0.77	x	2.08	x	67.96	x	0.85	x	0.7	=	58.28	(81)
Northwest	0.9x	0.77	x	2.08	x	91.35	x	0.85	x	0.7	=	78.34	(81)
Northwest	0.9x	0.77	x	2.08	x	97.38	x	0.85	x	0.7	=	83.52	(81)
Northwest	0.9x	0.77	x	2.08	x	91.1	x	0.85	x	0.7	=	78.13	(81)
Northwest	0.9x	0.77	x	2.08	x	72.63	x	0.85	x	0.7	=	62.29	(81)
Northwest	0.9x	0.77	x	2.08	x	50.42	x	0.85	x	0.7	=	43.24	(81)
Northwest	0.9x	0.77	x	2.08	x	28.07	x	0.85	x	0.7	=	24.07	(81)
Northwest	0.9x	0.77	x	2.08	x	14.2	x	0.85	x	0.7	=	12.18	(81)
Northwest	0.9x	0.77	x	2.08	x	9.21	x	0.85	x	0.7	=	7.9	(81)
Rooflights	0.9x	1	x	1.85	x	18.86	x	0.63	x	0.7	=	13.85	(82)
Rooflights	0.9x	1	x	1.85	x	39.78	x	0.63	x	0.7	=	29.21	(82)
Rooflights	0.9x	1	x	1.85	x	74.42	x	0.63	x	0.7	=	54.64	(82)

Rooflights 0.9x	1	x	1.85	x	125.11	x	0.63	x	0.7	=	91.87	(82)
Rooflights 0.9x	1	x	1.85	x	169.75	x	0.63	x	0.7	=	124.64	(82)
Rooflights 0.9x	1	x	1.85	x	181.43	x	0.63	x	0.7	=	133.22	(82)
Rooflights 0.9x	1	x	1.85	x	169.55	x	0.63	x	0.7	=	124.5	(82)
Rooflights 0.9x	1	x	1.85	x	134.35	x	0.63	x	0.7	=	98.65	(82)
Rooflights 0.9x	1	x	1.85	x	91.71	x	0.63	x	0.7	=	67.34	(82)
Rooflights 0.9x	1	x	1.85	x	49.39	x	0.63	x	0.7	=	36.27	(82)
Rooflights 0.9x	1	x	1.85	x	23.99	x	0.63	x	0.7	=	17.62	(82)
Rooflights 0.9x	1	x	1.85	x	15.23	x	0.63	x	0.7	=	11.18	(82)

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

(83)m=	218.17	380.47	543.78	712.25	832.58	841.78	805.24	713.19	601.8	426.78	262.94	185.66	(83)

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

(84)m=	685.65	845.73	993.74	1137.4	1232.32	1217.2	1164.95	1079.27	980.71	830.72	695.66	640.18	(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=	1	0.99	0.98	0.95	0.88	0.75	0.59	0.65	0.86	0.97	0.99	1	(86)

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

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

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

(88)m=	19.53	19.53	19.53	19.54	19.55	19.56	19.56	19.56	19.55	19.55	19.54	19.54	(88)

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

(89)m=	1	0.99	0.98	0.93	0.83	0.63	0.42	0.48	0.77	0.96	0.99	1	(89)

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

(90)m=	19.53	19.53	19.53	19.54	19.55	19.56	19.56	19.56	19.55	19.55	19.54	19.54	(90)

fLA = Living area ÷ (4) = | 0.22 | (91)

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

(92)m=	19.86	19.86	19.86	19.87	19.87	19.88	19.88	19.88	19.88	19.87	19.87	19.86	(92)

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

(93)m=	19.86	19.86	19.86	19.87	19.87	19.88	19.88	19.88	19.88	19.87	19.87	19.86	(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=	1	0.99	0.98	0.94	0.84	0.66	0.46	0.52	0.79	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	683.11	838.24	971.77	1067.5	1036.22	799.58	534.95	558.6	779.52	797.43	690.23	638.38	(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=	2676.25	2567.75	2288.5	1860	1382.88	885.54	550.09	582.92	972.22	1569.04	2169.14	2671.94	(97)

DER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1482.9	1162.23	979.64	570.6	257.92	0	0	0	0	574.08	1064.82	1512.97

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 7605.16 (98)

Space heating requirement in kWh/m²/year 76.01 (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		325.01	(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)	1482.9	1162.23	979.64	570.6	257.92	0	0	0	0	574.08	1064.82	1512.97		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	456.27	357.6	301.42	175.57	79.36	0	0	0	0	176.64	327.63	465.52		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2340	(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)	209.81	184.87	194.03	173.75	170.14	151.83	145.64	160.06	159.85	180.18	190.75	204.7		
Efficiency of water heater													178.12	(216)
(217)m=	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	117.79	103.79	108.93	97.54	95.51	85.24	81.76	89.86	89.74	101.15	107.09	114.92		
Total = Sum(219a)$_{1...12}$ =													1193.33	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2340	
Water heating fuel used			1193.33	
Electricity for pumps, fans and electric keep-hot				
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		0	(231)
Electricity for lighting			408.29	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			3941.62	(338)

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

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

DER WorkSheet: New dwelling design stage

Space heating (main system 1)	(211) x	0.519	=	1214.46	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	619.34	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1833.8	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	211.9	(268)
Total CO2, kg/year		sum of (265)…(271) =		2045.7	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		20.45	(273)
EI rating (section 14)				81	(274)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 23 November 2021 at 13:26:15

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 94.4m²

Site Reference : 11-12 Grenville Street - GREEN **Plot Reference:** Unit 2

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	26.94 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	28.67 kg/m²	**Fail**

Excess emissions = 1.73 kg/m² (6.4 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	107.1 kWh/m²	
		Fail

Excess energy = 49.07 kg/m² (84.6 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.30 (max. 0.30)	0.30 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	4.71 (max. 2.00)	4.80 (max. 3.30)	**Fail**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:

Regulations Compliance Report

	Measured cylinder loss: 1.47 kWh/day		
	Permitted by DBSCG: 2.10 kWh/day		OK
Primary pipework insulated:	Yes		OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Slight	OK

Based on:

Overshading:	Average or unknown
Windows facing: North East	10.89m²
Windows facing: North West	5.44m²
Windows facing: South West	6.21m²
Ventilation rate:	4.00

10 Key features

Party Walls U-value	0 W/m²K

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Unit 2

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	15.96	(1a)	x	3.3	(2a)	=	52.67	(3a)
First floor	39.22	(1b)	x	3.25	(2b)	=	127.47	(3b)
Second floor	39.22	(1c)	x	3.05	(2c)	=	119.62	(3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	94.4	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	299.75	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.13	(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			10	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.63	(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) =		0.63	(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

	1	2	3	4	5	6	7	8	9	10	11	12	
(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

	0.81	0.79	0.78	0.7	0.68	0.6	0.6	0.59	0.63	0.68	0.71	0.74	

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [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	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=	0.83	0.81	0.8	0.74	0.73	0.68	0.68	0.67	0.7	0.73	0.75	0.78	(24d)

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

(25)m=	0.83	0.81	0.8	0.74	0.73	0.68	0.68	0.67	0.7	0.73	0.75	0.78	(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			2.59	x	3.9	=	10.101			(26)
Windows Type 1			10.89	x1/[1/(4.8)+ 0.04]		=	43.85			(27)
Windows Type 2			5.44	x1/[1/(4.8)+ 0.04]		=	21.91			(27)
Windows Type 3			6.21	x1/[1/(4.8)+ 0.04]		=	25.01			(27)
Floor			15.96	x	0.15	=	2.394			(28)
Walls Type1	98.24	18.92	79.32	x	0.3	=	23.8			(29)
Walls Type2	22.87	6.21	16.66	x	0.28	=	4.66			(29)
Total area of elements, m²			137.07							(31)
Party wall			118.18	x	0	=	0			(32)
Party ceiling			39.22							(32b)

** 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) = 131.72 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9571.58 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 20.56 (36)

DER WorkSheet: New dwelling design stage

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

Total fabric heat loss (33) + (36) = 152.28 (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=	81.72	80.47	79.24	73.47	72.39	67.37	67.37	66.44	69.3	72.39	74.58	76.86	(38)

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

(39)m=	234	232.75	231.52	225.75	224.67	219.65	219.65	218.72	221.59	224.67	226.86	229.14	

Average = Sum(39)$_{1...12}$ /12= 225.75 (39)

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

(40)m=	2.48	2.47	2.45	2.39	2.38	2.33	2.33	2.32	2.35	2.38	2.4	2.43	

Average = Sum(40)$_{1...12}$ /12= 2.39 (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 2.68 (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 97.88 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	107.67	103.75	99.84	95.92	92.01	88.09	88.09	92.01	95.92	99.84	103.75	107.67	

Total = Sum(44)$_{1...12}$ = 1174.57 (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=	159.67	139.65	144.1	125.63	120.55	104.02	96.39	110.61	111.93	130.45	142.39	154.63	

Total = Sum(45)$_{1...12}$ = 1540.04 (45)

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

(46)m=	23.95	20.95	21.62	18.85	18.08	15.6	14.46	16.59	16.79	19.57	21.36	23.19	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.47 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.79 (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) 0.79 (55)

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

(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(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=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

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

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

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

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

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

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

(62)m=	207.54	182.89	191.97	171.96	168.42	150.35	144.26	158.48	158.26	178.32	188.72	202.5	(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=	207.54	182.89	191.97	171.96	168.42	150.35	144.26	158.48	158.26	178.32	188.72	202.5

Output from water heater (annual)$_{1...12}$ 2103.68 (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=	91.39	81.02	86.21	78.83	78.38	71.65	70.35	75.08	74.28	81.67	84.41	89.71	(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=	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	(66)

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

(67)m=	22.02	19.55	15.9	12.04	9	7.6	8.21	10.67	14.32	18.19	21.23	22.63	(67)

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

(68)m=	246.94	249.51	243.05	229.3	211.95	195.64	184.74	182.18	188.64	202.39	219.74	236.05	(68)

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

(69)m=	36.41	36.41	36.41	36.41	36.41	36.41	36.41	36.41	36.41	36.41	36.41	36.41	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-107.25	-107.25	-107.25	-107.25	-107.25	-107.25	-107.25	-107.25	-107.25	-107.25	-107.25	-107.25	(71)

Water heating gains (Table 5)

(72)m=	122.83	120.57	115.87	109.49	105.35	99.51	94.55	100.91	103.17	109.77	117.23	120.58	(72)

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

(73)m=	455.01	452.85	438.05	414.05	389.51	365.97	350.72	356.98	369.35	393.56	421.42	442.47	(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	10.89	x	11.28	x	0.85	x	0.7	=	50.66	(75)
Northeast 0.9x	0.77	x	10.89	x	22.97	x	0.85	x	0.7	=	103.13	(75)
Northeast 0.9x	0.77	x	10.89	x	41.38	x	0.85	x	0.7	=	185.8	(75)
Northeast 0.9x	0.77	x	10.89	x	67.96	x	0.85	x	0.7	=	305.14	(75)
Northeast 0.9x	0.77	x	10.89	x	91.35	x	0.85	x	0.7	=	410.17	(75)
Northeast 0.9x	0.77	x	10.89	x	97.38	x	0.85	x	0.7	=	437.29	(75)
Northeast 0.9x	0.77	x	10.89	x	91.1	x	0.85	x	0.7	=	409.07	(75)
Northeast 0.9x	0.77	x	10.89	x	72.63	x	0.85	x	0.7	=	326.12	(75)
Northeast 0.9x	0.77	x	10.89	x	50.42	x	0.85	x	0.7	=	226.41	(75)
Northeast 0.9x	0.77	x	10.89	x	28.07	x	0.85	x	0.7	=	126.03	(75)
Northeast 0.9x	0.77	x	10.89	x	14.2	x	0.85	x	0.7	=	63.75	(75)
Northeast 0.9x	0.77	x	10.89	x	9.21	x	0.85	x	0.7	=	41.37	(75)
Southwest 0.9x	0.77	x	6.21	x	36.79		0.85	x	0.7	=	94.21	(79)
Southwest 0.9x	0.77	x	6.21	x	62.67		0.85	x	0.7	=	160.48	(79)
Southwest 0.9x	0.77	x	6.21	x	85.75		0.85	x	0.7	=	219.58	(79)
Southwest 0.9x	0.77	x	6.21	x	106.25		0.85	x	0.7	=	272.07	(79)
Southwest 0.9x	0.77	x	6.21	x	119.01		0.85	x	0.7	=	304.74	(79)
Southwest 0.9x	0.77	x	6.21	x	118.15		0.85	x	0.7	=	302.54	(79)
Southwest 0.9x	0.77	x	6.21	x	113.91		0.85	x	0.7	=	291.68	(79)
Southwest 0.9x	0.77	x	6.21	x	104.39		0.85	x	0.7	=	267.3	(79)
Southwest 0.9x	0.77	x	6.21	x	92.85		0.85	x	0.7	=	237.76	(79)
Southwest 0.9x	0.77	x	6.21	x	69.27		0.85	x	0.7	=	177.37	(79)
Southwest 0.9x	0.77	x	6.21	x	44.07		0.85	x	0.7	=	112.85	(79)
Southwest 0.9x	0.77	x	6.21	x	31.49		0.85	x	0.7	=	80.63	(79)
Northwest 0.9x	0.77	x	5.44	x	11.28	x	0.85	x	0.7	=	25.31	(81)
Northwest 0.9x	0.77	x	5.44	x	22.97	x	0.85	x	0.7	=	51.52	(81)
Northwest 0.9x	0.77	x	5.44	x	41.38	x	0.85	x	0.7	=	92.82	(81)
Northwest 0.9x	0.77	x	5.44	x	67.96	x	0.85	x	0.7	=	152.43	(81)
Northwest 0.9x	0.77	x	5.44	x	91.35	x	0.85	x	0.7	=	204.9	(81)
Northwest 0.9x	0.77	x	5.44	x	97.38	x	0.85	x	0.7	=	218.44	(81)
Northwest 0.9x	0.77	x	5.44	x	91.1	x	0.85	x	0.7	=	204.35	(81)
Northwest 0.9x	0.77	x	5.44	x	72.63	x	0.85	x	0.7	=	162.91	(81)
Northwest 0.9x	0.77	x	5.44	x	50.42	x	0.85	x	0.7	=	113.1	(81)
Northwest 0.9x	0.77	x	5.44	x	28.07	x	0.85	x	0.7	=	62.96	(81)
Northwest 0.9x	0.77	x	5.44	x	14.2	x	0.85	x	0.7	=	31.85	(81)
Northwest 0.9x	0.77	x	5.44	x	9.21	x	0.85	x	0.7	=	20.67	(81)

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

(83)m=	170.19	315.13	498.2	729.64	919.81	958.27	905.1	756.33	577.26	366.35	208.44	142.67	(83)

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

(84)m=	625.2	767.98	936.24	1143.7	1309.33	1324.23	1255.82	1113.31	946.61	759.92	629.86	585.15	(84)

DER WorkSheet: New dwelling design stage

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=	1	0.99	0.98	0.95	0.89	0.77	0.64	0.71	0.89	0.98	0.99	1	(86)

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

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

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

(88)m=	19.03	19.04	19.05	19.09	19.09	19.12	19.12	19.13	19.11	19.09	19.08	19.06	(88)

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

(89)m=	0.99	0.99	0.97	0.93	0.83	0.63	0.42	0.49	0.8	0.96	0.99	1	(89)

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

(90)m=	19.03	19.04	19.05	19.09	19.09	19.12	19.12	19.13	19.11	19.09	19.08	19.06	(90)

fLA = Living area ÷ (4) = 0.35 (91)

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

(92)m=	19.72	19.73	19.73	19.75	19.76	19.78	19.78	19.78	19.77	19.76	19.75	19.74	(92)

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

(93)m=	19.72	19.73	19.73	19.75	19.76	19.78	19.78	19.78	19.77	19.76	19.75	19.74	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.98	0.94	0.85	0.69	0.51	0.58	0.84	0.97	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	621.8	760.04	914.83	1075.17	1115.97	913.71	639.12	649.47	797.7	733.91	624.03	582.58	(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=	3608.49	3450.71	3063.22	2450.45	1810.65	1137.8	698.5	740.15	1256.82	2057.8	2869.74	3560.97	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	2222.1	1808.12	1598.41	990.2	516.84	0	0	0	0	984.97	1616.91	2215.92	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 11953.48 (98)

Space heating requirement in kWh/m²/year — 126.63 (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		327.94	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

DER WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	2222.1	1808.12	1598.41	990.2	516.84	0	0	0	0	984.97	1616.91	2215.92		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	677.6	551.37	487.41	301.95	157.61	0	0	0	0	300.35	493.06	675.72		
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													3645.07	(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)														
	207.54	182.89	191.97	171.96	168.42	150.35	144.26	158.48	158.26	178.32	188.72	202.5		
Efficiency of water heater													178.12	(216)
(217)m=	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	116.51	102.67	107.78	96.54	94.55	84.41	80.99	88.97	88.85	100.11	105.95	113.69		
Total = Sum(219a)$_{1...12}$ =													1181.01	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			3645.07	
Water heating fuel used			1181.01	
Electricity for pumps, fans and electric keep-hot				
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		0	(231)
Electricity for lighting			388.8	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5214.88	(338)

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	=	1891.79	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	612.94	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2504.74	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	0	(267)
Electricity for lighting	(232)	x	0.519	=	201.79	(268)
Total CO2, kg/year			sum of (265)…(271) =		2706.52	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =		28.67	(273)
EI rating (section 14)					74	(274)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 23 November 2021 at 13:26:14

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 48.28m²

Site Reference : 11-12 Grenville Street - GREEN **Plot Reference:** Unit 3

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Electricity		
Fuel factor: 1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	34.6 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	33.75 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	109.8 kWh/m²	
		Fail

Excess energy = 44.01 kg/m² (66.9 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.30 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	4.10 (max. 2.00)	4.80 (max. 3.30)	**Fail**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.47 kWh/day	
	Permitted by DBSCG: 2.10 kWh/day	**OK**

Regulations Compliance Report

Primary pipework insulated:	Yes		OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services		OK
Hot water controls:	Cylinderstat		OK
	Independent timer for DHW		OK
Boiler interlock:	Yes		OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North East	7.36m²
Windows facing: South East	1.84m²
Ventilation rate:	8.00

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.11 W/m²K

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Unit 3

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	48.28	(1a) x	2.95	(2a) =	142.43	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.28	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		142.43	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.21	(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		10	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.71	(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) =	0.71	(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

DER WorkSheet: New dwelling design stage

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

0.91	0.89	0.87	0.78	0.76	0.68	0.68	0.66	0.71	0.76	0.8	0.83

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [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	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=	0.91	0.89	0.88	0.81	0.79	0.73	0.73	0.72	0.75	0.79	0.82	0.85	(24d)

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

(25)m=	0.91	0.89	0.88	0.81	0.79	0.73	0.73	0.72	0.75	0.79	0.82	0.85	(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			2.59	x	1.6	=	4.144			(26)
Windows Type 1			7.36	x1/[1/(4.8)+ 0.04]		=	29.64			(27)
Windows Type 2			1.84	x1/[1/(4.8)+ 0.04]		=	7.41			(27)
Floor			48.28	x	0.11	=	5.3108			(28)
Walls Type1	31.63	9.2	22.43	x	0.3	=	6.73			(29)
Walls Type2	33.43	2.59	30.84	x	0.22	=	6.9			(29)
Total area of elements, m²			113.34							(31)
Party wall			55.39	x	0	=	0			(32)
Party ceiling			48.28							(32b)

** 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) = 60.13 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6476.02 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 17 (36)

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

Total fabric heat loss (33) + (36) = 77.13 (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=	42.79	42.04	41.31	37.86	37.21	34.21	34.21	33.65	35.37	37.21	38.52	39.89	(38)

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

(39)m=	119.92	119.17	118.44	114.99	114.34	111.34	111.34	110.78	112.5	114.34	115.65	117.01	

Average = $Sum(39)_{1…12}$ /12= 114.99 (39)

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

(40)m=	2.48	2.47	2.45	2.38	2.37	2.31	2.31	2.29	2.33	2.37	2.4	2.42

Average = Sum(40)$_{1…12}$ /12= 2.38 (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 1.64 (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 73.14 (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=	80.45	77.53	74.6	71.68	68.75	65.83	65.83	68.75	71.68	74.6	77.53	80.45

Total = Sum(44)$_{1…12}$ = 877.69 (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=	119.31	104.35	107.68	93.88	90.08	77.73	72.03	82.65	83.64	97.48	106.4	115.55

Total = Sum(45)$_{1…12}$ = 1150.79 (45)

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

(46)m=	17.9	15.65	16.15	14.08	13.51	11.66	10.8	12.4	12.55	14.62	15.96	17.33	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.47 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.79 (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) 0.79 (55)

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

(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(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=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(57)

Primary circuit loss (annual) from Table 3 0 (58)

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

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

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

DER WorkSheet: New dwelling design stage

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

(61)m=	0	0	0	0	0	0	0	0	0	0	0	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=	167.18	147.59	155.55	140.2	137.95	124.06	119.9	130.52	129.97	145.35	152.73	163.42	(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=	167.18	147.59	155.55	140.2	137.95	124.06	119.9	130.52	129.97	145.35	152.73	163.42	

Output from water heater (annual)$_{1...12}$ 1714.42 (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=	77.97	69.29	74.1	68.28	68.25	62.91	62.25	65.78	64.87	70.71	72.44	76.72	(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=	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	(66)

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

(67)m=	12.75	11.32	9.21	6.97	5.21	4.4	4.75	6.18	8.29	10.53	12.29	13.1	(67)

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

(68)m=	142.77	144.25	140.52	132.57	122.54	113.11	106.81	105.33	109.06	117.01	127.04	136.47	(68)

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

(69)m=	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	(71)

Water heating gains (Table 5)

(72)m=	104.79	103.11	99.6	94.83	91.73	87.37	83.66	88.41	90.1	95.04	100.61	103.11	(72)

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

(73)m=	307.9	306.27	296.91	281.96	267.07	252.47	242.82	247.51	255.05	270.17	287.53	300.28	(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	7.36	x	11.28	x	0.85	x	0.7	=	34.24	(75)
Northeast 0.9x	0.77	x	7.36	x	22.97	x	0.85	x	0.7	=	69.7	(75)
Northeast 0.9x	0.77	x	7.36	x	41.38	x	0.85	x	0.7	=	125.58	(75)
Northeast 0.9x	0.77	x	7.36	x	67.96	x	0.85	x	0.7	=	206.23	(75)
Northeast 0.9x	0.77	x	7.36	x	91.35	x	0.85	x	0.7	=	277.22	(75)

Northeast 0.9x	0.77	x	7.36	x	97.38	x	0.85	x	0.7	=	295.54	(75)
Northeast 0.9x	0.77	x	7.36	x	91.1	x	0.85	x	0.7	=	276.47	(75)
Northeast 0.9x	0.77	x	7.36	x	72.63	x	0.85	x	0.7	=	220.41	(75)
Northeast 0.9x	0.77	x	7.36	x	50.42	x	0.85	x	0.7	=	153.02	(75)
Northeast 0.9x	0.77	x	7.36	x	28.07	x	0.85	x	0.7	=	85.18	(75)
Northeast 0.9x	0.77	x	7.36	x	14.2	x	0.85	x	0.7	=	43.08	(75)
Northeast 0.9x	0.77	x	7.36	x	9.21	x	0.85	x	0.7	=	27.96	(75)
Southeast 0.9x	0.77	x	1.84	x	36.79	x	0.85	x	0.7	=	27.92	(77)
Southeast 0.9x	0.77	x	1.84	x	62.67	x	0.85	x	0.7	=	47.55	(77)
Southeast 0.9x	0.77	x	1.84	x	85.75	x	0.85	x	0.7	=	65.06	(77)
Southeast 0.9x	0.77	x	1.84	x	106.25	x	0.85	x	0.7	=	80.61	(77)
Southeast 0.9x	0.77	x	1.84	x	119.01	x	0.85	x	0.7	=	90.29	(77)
Southeast 0.9x	0.77	x	1.84	x	118.15	x	0.85	x	0.7	=	89.64	(77)
Southeast 0.9x	0.77	x	1.84	x	113.91	x	0.85	x	0.7	=	86.42	(77)
Southeast 0.9x	0.77	x	1.84	x	104.39	x	0.85	x	0.7	=	79.2	(77)
Southeast 0.9x	0.77	x	1.84	x	92.85	x	0.85	x	0.7	=	70.45	(77)
Southeast 0.9x	0.77	x	1.84	x	69.27	x	0.85	x	0.7	=	52.55	(77)
Southeast 0.9x	0.77	x	1.84	x	44.07	x	0.85	x	0.7	=	33.44	(77)
Southeast 0.9x	0.77	x	1.84	x	31.49	x	0.85	x	0.7	=	23.89	(77)

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

(83)m=	62.16	117.25	190.64	286.84	367.51	385.18	362.9	299.61	223.46	137.73	76.52	51.85	(83)

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

(84)m=	370.06	423.52	487.55	568.8	634.58	637.65	605.71	547.12	478.51	407.9	364.05	352.13	(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=	0.99	0.99	0.98	0.96	0.9	0.79	0.67	0.72	0.89	0.97	0.99	0.99	(86)

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

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

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

(88)m=	19.03	19.04	19.05	19.09	19.1	19.14	19.14	19.14	19.12	19.1	19.08	19.07	(88)

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

(89)m=	0.99	0.99	0.97	0.93	0.84	0.66	0.44	0.51	0.81	0.95	0.99	0.99	(89)

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

(90)m=	19.03	19.04	19.05	19.09	19.1	19.14	19.14	19.14	19.12	19.1	19.08	19.07	(90)

fLA = Living area ÷ (4) = 0.55 (91)

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

(92)m=	20.11	20.11	20.12	20.13	20.14	20.16	20.16	20.16	20.15	20.14	20.13	20.12	(92)

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

DER WorkSheet: New dwelling design stage

(93)m=	20.11	20.11	20.12	20.13	20.14	20.16	20.16	20.16	20.15	20.14	20.13	20.12	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:														
(94)m=	0.99	0.99	0.98	0.95	0.88	0.74	0.58	0.64	0.86	0.97	0.99	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	367.29	418.54	476.69	539.18	556.77	471.2	349.24	350.89	412.74	393.64	359.76	349.89		(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=	1895.64	1812.79	1612.6	1291.89	964.89	618.57	395.89	416.43	680.5	1090.67	1507.04	1863.27		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	1137.1	936.93	845.12	541.95	303.65	0	0	0	0	518.59	826.05	1125.96		
Total per year (kWh/year) = Sum(98)1...5,9...12 =													6235.33	(98)
Space heating requirement in kWh/m²/year													129.15	(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		319.5	(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)														
	1137.1	936.93	845.12	541.95	303.65	0	0	0	0	518.59	826.05	1125.96		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	355.9	293.25	264.51	169.62	95.04	0	0	0	0	162.31	258.54	352.41		
Total (kWh/year) =Sum(211)1...5,10...12=													1951.59	(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

Output from water heater (calculated above)														
	167.18	147.59	155.55	140.2	137.95	124.06	119.9	130.52	129.97	145.35	152.73	163.42		
Efficiency of water heater													178.12	(216)
(217)m=	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	93.86	82.86	87.33	78.71	77.45	69.65	67.31	73.28	72.96	81.6	85.74	91.74		
Total = Sum(219a)1...12 =													962.48	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1951.59

DER WorkSheet: New dwelling design stage

Water heating fuel used		962.48	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	0	(231)
Electricity for lighting		225.11	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3139.18	(338)

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	=	1012.88	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	499.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1512.4	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	0	(267)
Electricity for lighting	(232)	x	0.519	=	116.83	(268)
Total CO2, kg/year			sum of (265)…(271) =		1629.23	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =		33.75	(273)
EI rating (section 14)					77	(274)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 23 November 2021 at 13:26:13

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 48.28m²

Site Reference : 11-12 Grenville Street - GREEN **Plot Reference:** Unit 4

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	30.93 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	31.68 kg/m²	**Fail**

Excess emissions = 0.75 kg/m² (2.4 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	100.2 kWh/m²	
		Fail

Excess energy = 46.56 kg/m² (86.8 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.30 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	4.14 (max. 2.00)	4.80 (max. 3.30)	**Fail**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:

Regulations Compliance Report

	Measured cylinder loss: 1.47 kWh/day	
	Permitted by DBSCG: 2.10 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	Cylinderstat	**OK**
	Independent timer for DHW	**OK**
Boiler interlock:	Yes	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	6.3m²
Windows facing: South East	1.84m²
Windows facing: South West	1.89m²
Ventilation rate:	8.00

10 Key features

Party Walls U-value	0 W/m²K

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Unit 4

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	48.28	(1a) x	2.75	(2a) =	132.77	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.28	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		132.77	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.23	(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		10	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.73	(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) =	0.73	(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

DER WorkSheet: New dwelling design stage

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

0.93	0.91	0.89	0.8	0.78	0.69	0.69	0.67	0.73	0.78	0.82	0.85

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [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	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=	0.93	0.91	0.9	0.82	0.8	0.74	0.74	0.73	0.76	0.8	0.83	0.86	(24d)

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

(25)m=	0.93	0.91	0.9	0.82	0.8	0.74	0.74	0.73	0.76	0.8	0.83	0.86	(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			2.59	x	1.6	=	4.144			(26)
Windows Type 1			6.3	x1/[1/(4.8)+ 0.04]		=	25.37			(27)
Windows Type 2			1.84	x1/[1/(4.8)+ 0.04]		=	7.41			(27)
Windows Type 3			1.89	x1/[1/(4.8)+ 0.04]		=	7.61			(27)
Walls Type1	45.25	10.03	35.22	x	0.3	=	10.57			(29)
Walls Type2	31.16	2.59	28.57	x	0.22	=	6.39			(29)
Total area of elements, m²			76.41							(31)
Party wall			35.87	x	0	=	0			(32)
Party ceiling			48.28							(32b)

** 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) = 61.49 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4610.93 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 11.46 (36)

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

Total fabric heat loss (33) + (36) = 72.95 (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=	40.68	39.95	39.23	35.88	35.25	32.33	32.33	31.79	33.45	35.25	36.52	37.85	(38)

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

(39)m=	113.63	112.9	112.18	108.83	108.2	105.28	105.28	104.74	106.4	108.2	109.47	110.8	

Average = $Sum(39)_{1…12}$ /12= 108.82 (39)

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

(40)m=	2.35	2.34	2.32	2.25	2.24	2.18	2.18	2.17	2.2	2.24	2.27	2.29

Average = Sum(40)$_{1…12}$ /12= 2.25 (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 1.64 (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 73.14 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m=	80.45	77.53	74.6	71.68	68.75	65.83	65.83	68.75	71.68	74.6	77.53	80.45

Total = Sum(44)$_{1…12}$ = 877.69 (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=	119.31	104.35	107.68	93.88	90.08	77.73	72.03	82.65	83.64	97.48	106.4	115.55

Total = Sum(45)$_{1…12}$ = 1150.79 (45)

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

(46)m=	17.9	15.65	16.15	14.08	13.51	11.66	10.8	12.4	12.55	14.62	15.96	17.33	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

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

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

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 1.47 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.79 (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) 0.79 (55)

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

(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(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=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(57)

Primary circuit loss (annual) from Table 3 0 (58)

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

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

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

DER WorkSheet: New dwelling design stage

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

(61)m=	0	0	0	0	0	0	0	0	0	0	0	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=	167.18	147.59	155.55	140.2	137.95	124.06	119.9	130.52	129.97	145.35	152.73	163.42	(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=	167.18	147.59	155.55	140.2	137.95	124.06	119.9	130.52	129.97	145.35	152.73	163.42	

Output from water heater (annual)$_{1...12}$ 1714.42 (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=	77.97	69.29	74.1	68.28	68.25	62.91	62.25	65.78	64.87	70.71	72.44	76.72	(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=	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	81.98	(66)

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

(67)m=	12.73	11.3	9.19	6.96	5.2	4.39	4.75	6.17	8.28	10.51	12.27	13.08	(67)

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

(68)m=	142.77	144.25	140.52	132.57	122.54	113.11	106.81	105.33	109.06	117.01	127.04	136.47	(68)

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

(69)m=	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	-65.58	(71)

Water heating gains (Table 5)

(72)m=	104.79	103.11	99.6	94.83	91.73	87.37	83.66	88.41	90.1	95.04	100.61	103.11	(72)

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

(73)m=	307.88	306.25	296.9	281.95	267.06	252.46	242.81	247.5	255.03	270.15	287.52	300.26	(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	6.3	x	11.28	x	0.85	x	0.7	=	29.31	(75)
Northeast 0.9x	0.77	x	6.3	x	22.97	x	0.85	x	0.7	=	59.66	(75)
Northeast 0.9x	0.77	x	6.3	x	41.38	x	0.85	x	0.7	=	107.49	(75)
Northeast 0.9x	0.77	x	6.3	x	67.96	x	0.85	x	0.7	=	176.53	(75)
Northeast 0.9x	0.77	x	6.3	x	91.35	x	0.85	x	0.7	=	237.29	(75)

Northeast 0.9x	0.77	x	6.3	x	97.38	x	0.85	x	0.7	=	252.98	(75)
Northeast 0.9x	0.77	x	6.3	x	91.1	x	0.85	x	0.7	=	236.65	(75)
Northeast 0.9x	0.77	x	6.3	x	72.63	x	0.85	x	0.7	=	188.66	(75)
Northeast 0.9x	0.77	x	6.3	x	50.42	x	0.85	x	0.7	=	130.98	(75)
Northeast 0.9x	0.77	x	6.3	x	28.07	x	0.85	x	0.7	=	72.91	(75)
Northeast 0.9x	0.77	x	6.3	x	14.2	x	0.85	x	0.7	=	36.88	(75)
Northeast 0.9x	0.77	x	6.3	x	9.21	x	0.85	x	0.7	=	23.94	(75)
Southeast 0.9x	0.77	x	1.84	x	36.79	x	0.85	x	0.7	=	27.92	(77)
Southeast 0.9x	0.77	x	1.84	x	62.67	x	0.85	x	0.7	=	47.55	(77)
Southeast 0.9x	0.77	x	1.84	x	85.75	x	0.85	x	0.7	=	65.06	(77)
Southeast 0.9x	0.77	x	1.84	x	106.25	x	0.85	x	0.7	=	80.61	(77)
Southeast 0.9x	0.77	x	1.84	x	119.01	x	0.85	x	0.7	=	90.29	(77)
Southeast 0.9x	0.77	x	1.84	x	118.15	x	0.85	x	0.7	=	89.64	(77)
Southeast 0.9x	0.77	x	1.84	x	113.91	x	0.85	x	0.7	=	86.42	(77)
Southeast 0.9x	0.77	x	1.84	x	104.39	x	0.85	x	0.7	=	79.2	(77)
Southeast 0.9x	0.77	x	1.84	x	92.85	x	0.85	x	0.7	=	70.45	(77)
Southeast 0.9x	0.77	x	1.84	x	69.27	x	0.85	x	0.7	=	52.55	(77)
Southeast 0.9x	0.77	x	1.84	x	44.07	x	0.85	x	0.7	=	33.44	(77)
Southeast 0.9x	0.77	x	1.84	x	31.49	x	0.85	x	0.7	=	23.89	(77)
Southwest 0.9x	0.77	x	1.89	x	36.79		0.85	x	0.7	=	28.67	(79)
Southwest 0.9x	0.77	x	1.89	x	62.67		0.85	x	0.7	=	48.84	(79)
Southwest 0.9x	0.77	x	1.89	x	85.75		0.85	x	0.7	=	66.83	(79)
Southwest 0.9x	0.77	x	1.89	x	106.25		0.85	x	0.7	=	82.8	(79)
Southwest 0.9x	0.77	x	1.89	x	119.01		0.85	x	0.7	=	92.75	(79)
Southwest 0.9x	0.77	x	1.89	x	118.15		0.85	x	0.7	=	92.08	(79)
Southwest 0.9x	0.77	x	1.89	x	113.91		0.85	x	0.7	=	88.77	(79)
Southwest 0.9x	0.77	x	1.89	x	104.39		0.85	x	0.7	=	81.35	(79)
Southwest 0.9x	0.77	x	1.89	x	92.85		0.85	x	0.7	=	72.36	(79)
Southwest 0.9x	0.77	x	1.89	x	69.27		0.85	x	0.7	=	53.98	(79)
Southwest 0.9x	0.77	x	1.89	x	44.07		0.85	x	0.7	=	34.34	(79)
Southwest 0.9x	0.77	x	1.89	x	31.49		0.85	x	0.7	=	24.54	(79)

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

(83)m=	85.9	156.05	239.38	339.95	420.33	434.69	411.85	349.22	273.79	179.44	104.66	72.36	(83)

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

(84)m=	393.78	462.31	536.28	621.9	687.39	687.16	654.66	596.72	528.82	449.6	392.18	372.62	(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=	0.99	0.99	0.98	0.94	0.87	0.75	0.62	0.67	0.86	0.96	0.99	0.99	(86)

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

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

DER WorkSheet: New dwelling design stage

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

(88)m=	19.11	19.12	19.13	19.17	19.18	19.22	19.22	19.22	19.2	19.18	19.16	19.14	(88)

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

(89)m=	0.99	0.98	0.97	0.92	0.81	0.61	0.4	0.47	0.77	0.94	0.98	0.99	(89)

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

(90)m=	19.11	19.12	19.13	19.17	19.18	19.22	19.22	19.22	19.2	19.18	19.16	19.14	(90)

fLA = Living area ÷ (4) = 0.55 (91)

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

(92)m=	20.14	20.15	20.15	20.17	20.17	20.19	20.19	20.19	20.18	20.17	20.17	20.16	(92)

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

(93)m=	20.14	20.15	20.15	20.17	20.17	20.19	20.19	20.19	20.18	20.17	20.17	20.16	(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=	0.99	0.99	0.97	0.93	0.85	0.7	0.53	0.59	0.83	0.95	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	390.39	455.54	520.96	580.75	584.3	478.29	345.99	351.79	437.08	429.22	386.59	369.94	(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=	1800.12	1721.31	1531.39	1226.52	916.88	588.64	378.09	397.43	647.42	1035.9	1430.39	1768.19	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1048.84	850.6	751.76	464.96	247.44	0	0	0	0	451.37	751.54	1040.3	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 5606.81 (98)

Space heating requirement in kWh/m²/year 116.13 (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		318.57	(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)													
	1048.84	850.6	751.76	464.96	247.44	0	0	0	0	451.37	751.54	1040.3	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	329.24	267.01	235.98	145.95	77.67	0	0	0	0	141.69	235.91	326.56	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1760 (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)

DER WorkSheet: New dwelling design stage

Water heating

Output from water heater (calculated above)

167.18	147.59	155.55	140.2	137.95	124.06	119.9	130.52	129.97	145.35	152.73	163.42

Efficiency of water heater 178.12 (216)

(217)m=	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	93.86	82.86	87.33	78.71	77.45	69.65	67.31	73.28	72.96	81.6	85.74	91.74

Total = Sum(219a)$_{1...12}$ = 962.48 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1760	
Water heating fuel used		962.48	
Electricity for pumps, fans and electric keep-hot			
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	0	(231)
Electricity for lighting		224.78	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2947.26	(338)

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	=	913.44	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	499.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1412.97	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	0	(267)
Electricity for lighting	(232)	x	0.519	=	116.66	(268)
Total CO2, kg/year			sum of (265)…(271) =		1529.63	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =		31.68	(273)
EI rating (section 14)					78	(274)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 23 November 2021 at 13:26:12

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 55.35m²

Site Reference : 11-12 Grenville Street - GREEN **Plot Reference:** Unit 5

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	30.8 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	31.15 kg/m²	Fail

Excess emissions = 0.35 kg/m² (1.1 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	102.4 kWh/m²	
		Fail

Excess energy = 45.29 kg/m² (79.3 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.28 (max. 0.30)	0.30 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	4.18 (max. 2.00)	4.80 (max. 3.30)	Fail

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:

Regulations Compliance Report

	Measured cylinder loss: 1.47 kWh/day		
	Permitted by DBSCG: 2.10 kWh/day		OK
Primary pipework insulated:	Yes		OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	3.5m²	
Windows facing: South East	1.95m²	
Windows facing: South West	5.4m²	
Ventilation rate:	8.00	

10 Key features

Roofs U-value	0.1 W/m²K
Party Walls U-value	0 W/m²K

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Unit 5

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.35	(1a) x	2.6	(2a) =	143.91	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.35	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	143.91	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.21	(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		10	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.71	(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) =	0.71	(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

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

0.9	0.89	0.87	0.78	0.76	0.67	0.67	0.66	0.71	0.76	0.8	0.83

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [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	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 + [$(22b)m^2$ x 0.5]

(24d)m=	0.91	0.89	0.88	0.8	0.79	0.73	0.73	0.71	0.75	0.79	0.82	0.85	(24d)

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

(25)m=	0.91	0.89	0.88	0.8	0.79	0.73	0.73	0.71	0.75	0.79	0.82	0.85	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m^2)	Openings m^2	Net Area A ,m^2		U-value W/m2K		A X U (W/K)	k-value kJ/m^2·K	A X k kJ/K	
Doors			2.59	x	1.6	=	4.144			(26)
Windows Type 1			3.5	x1/[1/(4.8)+ 0.04]		=	14.09			(27)
Windows Type 2			1.95	x1/[1/(4.8)+ 0.04]		=	7.85			(27)
Windows Type 3			5.4	x1/[1/(4.8)+ 0.04]		=	21.74			(27)
Walls Type1	53.86	8.9	44.96	x	0.3	=	13.49			(29)
Walls Type2	16.06	2.59	13.47	x	0.22	=	3.01			(29)
Walls Type3	3.94	1.95	1.99	x	0.28	=	0.56			(29)
Roof Type1	37.6	0	37.6	x	0.1	=	3.76			(30)
Roof Type2	5.33	0	5.33	x	0.14	=	0.75			(30)
Roof Type3	13.05	0	13.05	x	0.14	=	1.83			(30)
Total area of elements, m^2			129.84							(31)
Party wall			51.22	x	0	=	0			(32)
Party floor			55.35							(32a)

** 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) = 71.23 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5699.97 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m^2K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 19.48 (36)

DER WorkSheet: New dwelling design stage

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

Total fabric heat loss (33) + (36) = 90.7 (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=	43.12	42.37	41.63	38.17	37.52	34.5	34.5	33.94	35.66	37.52	38.83	40.2	(38)

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

(39)m=	133.82	133.07	132.33	128.87	128.22	125.2	125.2	124.64	126.37	128.22	129.53	130.9	

Average = $Sum(39)_{1...12}$ /12= 128.87 (39)

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

(40)m=	2.42	2.4	2.39	2.33	2.32	2.26	2.26	2.25	2.28	2.32	2.34	2.36

Average = $Sum(40)_{1...12}$ /12= 2.33 (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 1.85 (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 78.08 (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)

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

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

(44)m=	85.89	82.77	79.64	76.52	73.4	70.27	70.27	73.4	76.52	79.64	82.77	85.89

Total = $Sum(44)_{1...12}$ = 936.97 (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=	127.37	111.4	114.95	100.22	96.16	82.98	76.89	88.24	89.29	104.06	113.59	123.35

Total = $Sum(45)_{1...12}$ = 1228.51 (45)

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

(46)m=	19.11	16.71	17.24	15.03	14.42	12.45	11.53	13.24	13.39	15.61	17.04	18.5	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.47 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.79 (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) 0.79 (55)

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

(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(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=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

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

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

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

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

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

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

(62)m=	175.24	154.64	162.82	146.55	144.03	129.31	124.76	136.11	135.62	151.93	159.92	171.22	(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=	175.24	154.64	162.82	146.55	144.03	129.31	124.76	136.11	135.62	151.93	159.92	171.22

Output from water heater (annual)$_{1...12}$ 1792.15 (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=	80.65	71.63	76.52	70.38	70.27	64.65	63.86	67.64	66.75	72.9	74.83	79.31	(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=	92.38	92.38	92.38	92.38	92.38	92.38	92.38	92.38	92.38	92.38	92.38	92.38	(66)

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

(67)m=	14.36	12.76	10.38	7.86	5.87	4.96	5.36	6.96	9.35	11.87	13.85	14.76	(67)

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

(68)m=	161.09	162.76	158.55	149.58	138.26	127.62	120.51	118.84	123.05	132.02	143.34	153.98	(68)

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

(69)m=	32.24	32.24	32.24	32.24	32.24	32.24	32.24	32.24	32.24	32.24	32.24	32.24	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-73.9	-73.9	-73.9	-73.9	-73.9	-73.9	-73.9	-73.9	-73.9	-73.9	-73.9	-73.9	(71)

Water heating gains (Table 5)

(72)m=	108.4	106.59	102.85	97.76	94.45	89.79	85.84	90.91	92.71	97.98	103.93	106.6	(72)

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

(73)m=	334.56	332.82	322.48	305.9	289.29	273.09	262.42	267.42	275.82	292.58	311.83	326.06	(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.5	x	11.28	x	0.85	x	0.7	=	16.28	(75)
Northeast 0.9x	0.77	x	3.5	x	22.97	x	0.85	x	0.7	=	33.14	(75)
Northeast 0.9x	0.77	x	3.5	x	41.38	x	0.85	x	0.7	=	59.72	(75)
Northeast 0.9x	0.77	x	3.5	x	67.96	x	0.85	x	0.7	=	98.07	(75)
Northeast 0.9x	0.77	x	3.5	x	91.35	x	0.85	x	0.7	=	131.83	(75)
Northeast 0.9x	0.77	x	3.5	x	97.38	x	0.85	x	0.7	=	140.54	(75)
Northeast 0.9x	0.77	x	3.5	x	91.1	x	0.85	x	0.7	=	131.47	(75)
Northeast 0.9x	0.77	x	3.5	x	72.63	x	0.85	x	0.7	=	104.81	(75)
Northeast 0.9x	0.77	x	3.5	x	50.42	x	0.85	x	0.7	=	72.77	(75)
Northeast 0.9x	0.77	x	3.5	x	28.07	x	0.85	x	0.7	=	40.51	(75)
Northeast 0.9x	0.77	x	3.5	x	14.2	x	0.85	x	0.7	=	20.49	(75)
Northeast 0.9x	0.77	x	3.5	x	9.21	x	0.85	x	0.7	=	13.3	(75)
Southeast 0.9x	0.77	x	1.95	x	36.79	x	0.85	x	0.7	=	29.58	(77)
Southeast 0.9x	0.77	x	1.95	x	62.67	x	0.85	x	0.7	=	50.39	(77)
Southeast 0.9x	0.77	x	1.95	x	85.75	x	0.85	x	0.7	=	68.95	(77)
Southeast 0.9x	0.77	x	1.95	x	106.25	x	0.85	x	0.7	=	85.43	(77)
Southeast 0.9x	0.77	x	1.95	x	119.01	x	0.85	x	0.7	=	95.69	(77)
Southeast 0.9x	0.77	x	1.95	x	118.15	x	0.85	x	0.7	=	95	(77)
Southeast 0.9x	0.77	x	1.95	x	113.91	x	0.85	x	0.7	=	91.59	(77)
Southeast 0.9x	0.77	x	1.95	x	104.39	x	0.85	x	0.7	=	83.94	(77)
Southeast 0.9x	0.77	x	1.95	x	92.85	x	0.85	x	0.7	=	74.66	(77)
Southeast 0.9x	0.77	x	1.95	x	69.27	x	0.85	x	0.7	=	55.69	(77)
Southeast 0.9x	0.77	x	1.95	x	44.07	x	0.85	x	0.7	=	35.44	(77)
Southeast 0.9x	0.77	x	1.95	x	31.49	x	0.85	x	0.7	=	25.32	(77)
Southwest 0.9x	0.77	x	5.4	x	36.79		0.85	x	0.7	=	81.93	(79)
Southwest 0.9x	0.77	x	5.4	x	62.67		0.85	x	0.7	=	139.55	(79)
Southwest 0.9x	0.77	x	5.4	x	85.75		0.85	x	0.7	=	190.94	(79)
Southwest 0.9x	0.77	x	5.4	x	106.25		0.85	x	0.7	=	236.58	(79)
Southwest 0.9x	0.77	x	5.4	x	119.01		0.85	x	0.7	=	264.99	(79)
Southwest 0.9x	0.77	x	5.4	x	118.15		0.85	x	0.7	=	263.07	(79)
Southwest 0.9x	0.77	x	5.4	x	113.91		0.85	x	0.7	=	253.63	(79)
Southwest 0.9x	0.77	x	5.4	x	104.39		0.85	x	0.7	=	232.44	(79)
Southwest 0.9x	0.77	x	5.4	x	92.85		0.85	x	0.7	=	206.74	(79)
Southwest 0.9x	0.77	x	5.4	x	69.27		0.85	x	0.7	=	154.23	(79)
Southwest 0.9x	0.77	x	5.4	x	44.07		0.85	x	0.7	=	98.13	(79)
Southwest 0.9x	0.77	x	5.4	x	31.49		0.85	x	0.7	=	70.11	(79)

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

(83)m=	127.79	223.09	319.6	420.08	492.51	498.62	476.7	421.19	354.17	250.43	154.05	108.73	(83)

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

(84)m=	462.36	555.91	642.09	725.99	781.8	771.7	739.12	688.61	629.99	543.01	465.89	434.78	(84)

DER WorkSheet: New dwelling design stage

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.97	0.94	0.88	0.77	0.63	0.68	0.86	0.96	0.99	0.99	(86)

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

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

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

(88)m=	19.07	19.08	19.09	19.12	19.13	19.16	19.16	19.17	19.15	19.13	19.12	19.1	(88)

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

(89)m=	0.99	0.98	0.96	0.92	0.82	0.63	0.41	0.47	0.76	0.93	0.98	0.99	(89)

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

(90)m=	19.07	19.08	19.09	19.12	19.13	19.16	19.16	19.17	19.15	19.13	19.12	19.1	(90)

fLA = Living area ÷ (4) = 0.55 (91)

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

(92)m=	20.13	20.14	20.14	20.16	20.16	20.18	20.18	20.18	20.17	20.16	20.16	20.15	(92)

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

(93)m=	20.13	20.14	20.14	20.16	20.16	20.18	20.18	20.18	20.17	20.16	20.16	20.15	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.97	0.93	0.86	0.71	0.55	0.6	0.82	0.95	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	458.07	546.7	621.86	677.09	669.83	551.03	403.67	411.73	516.72	515.64	458.58	431.45	(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=	2118.97	2027.7	1805.21	1450.87	1084.97	698.24	447.84	471.12	767.17	1226.01	1691.06	2087.69	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1235.71	995.23	880.41	557.12	308.87	0	0	0	0	528.51	887.38	1232.24	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 6625.48 (98)

Space heating requirement in kWh/m²/year 119.7 (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		321.29	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

DER WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	1235.71	995.23	880.41	557.12	308.87	0	0	0	0	528.51	887.38	1232.24		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	384.61	309.76	274.02	173.4	96.13	0	0	0	0	164.5	276.19	383.53		
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2062.14	(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)														
	175.24	154.64	162.82	146.55	144.03	129.31	124.76	136.11	135.62	151.93	159.92	171.22		
Efficiency of water heater													178.12	(216)
(217)m=	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	98.38	86.81	91.41	82.27	80.86	72.59	70.04	76.41	76.14	85.29	89.78	96.12		
Total = Sum(219a)$_{1...12}$ =													1006.12	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2062.14	
Water heating fuel used			1006.12	
Electricity for pumps, fans and electric keep-hot				
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		0	(231)
Electricity for lighting			253.69	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			3321.94	(338)

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	=	1070.25	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	522.17	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1592.42	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	131.66	(268)
Total CO2, kg/year		sum of (265)…(271) =		1724.09	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		31.15	(273)
EI rating (section 14)				77	(274)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 23 November 2021 at 13:26:11

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 37.37m²

Site Reference : 11-12 Grenville Street - GREEN **Plot Reference:** Unit 6

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	35.13 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	36.42 kg/m²	**Fail**

Excess emissions = 1.29 kg/m² (3.7 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	95.3 kWh/m²	
		Fail

Excess energy = 39.11 kg/m² (69.6 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.30 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	**OK**
Openings	3.73 (max. 2.00)	4.80 (max. 3.30)	**Fail**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi ECODAN 5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:

Regulations Compliance Report

	Measured cylinder loss: 1.47 kWh/day	
	Permitted by DBSCG: 2.10 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	Cylinderstat	**OK**
	Independent timer for DHW	**OK**
Boiler interlock:	Yes	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	5.19m²	
Ventilation rate:	8.00	

10 Key features

Roofs U-value	0.1 W/m²K
Party Walls U-value	0 W/m²K

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Unit 6

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	37.37	(1a) x	2.65	(2a) =	99.03	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	37.37	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	99.03	(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							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.2	(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		10	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.7	(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) =	0.7	(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

DER WorkSheet: New dwelling design stage

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

0.89	0.88	0.86	0.77	0.75	0.67	0.67	0.65	0.7	0.75	0.79	0.82

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [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	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=	0.9	0.88	0.87	0.8	0.78	0.72	0.72	0.71	0.75	0.78	0.81	0.84	(24d)

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

(25)m=	0.9	0.88	0.87	0.8	0.78	0.72	0.72	0.71	0.75	0.78	0.81	0.84	(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			2.59	x	1.6	=	4.144			(26)
Windows			5.19	x1/[1/(4.8)+ 0.04]		=	20.9			(27)
Walls Type1	19.61	5.19	14.42	x	0.3	=	4.33			(29)
Walls Type2	10.13	2.59	7.54	x	0.22	=	1.69			(29)
Roof	37.33	0	37.33	x	0.1	=	3.73			(30)
Total area of elements, m²			67.07							(31)
Party wall			22.79	x	0	=	0			(32)
Party floor			37.33							(32a)

** 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) = 34.79 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3063.6 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 10.06 (36)

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

Total fabric heat loss (33) + (36) = 44.85 (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=	29.43	28.92	28.42	26.08	25.64	23.61	23.61	23.23	24.39	25.64	26.53	27.46	(38)

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

(39)m=	74.28	73.77	73.27	70.93	70.49	68.46	68.46	68.08	69.24	70.49	71.38	72.31	

Average = Sum(39)$_{1…12}$ /12= 70.93 (39)

DER WorkSheet: New dwelling design stage

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

(40)m=	1.99	1.97	1.96	1.9	1.89	1.83	1.83	1.82	1.85	1.89	1.91	1.93

Average = Sum(40)$_{1…12}$ /12= 1.9 (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 1.34 (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 65.99 (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)

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

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

(44)m=	72.58	69.94	67.3	64.67	62.03	59.39	59.39	62.03	64.67	67.3	69.94	72.58

Total = Sum(44)$_{1…12}$ = 791.82 (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=	107.64	94.14	97.15	84.69	81.27	70.13	64.98	74.57	75.46	87.94	95.99	104.24

Total = Sum(45)$_{1…12}$ = 1038.2 (45)

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

(46)m=	16.15	14.12	14.57	12.7	12.19	10.52	9.75	11.19	11.32	13.19	14.4	15.64

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.47 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.79 (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) 0.79 (55)

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

(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61

(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=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61

(57)

Primary circuit loss (annual) from Table 3 0 (58)

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

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

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

(59)

DER WorkSheet: New dwelling design stage

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

(61)m=	0	0	0	0	0	0	0	0	0	0	0	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=	155.51	137.38	145.02	131.02	129.14	116.45	112.85	122.44	121.79	135.81	142.32	152.11	(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=	155.51	137.38	145.02	131.02	129.14	116.45	112.85	122.44	121.79	135.81	142.32	152.11	

Output from water heater (annual)$_{1…12}$ 1601.84 (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=	74.09	65.89	70.6	65.22	65.32	60.38	59.9	63.09	62.15	67.54	68.98	72.96	(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=	66.92	66.92	66.92	66.92	66.92	66.92	66.92	66.92	66.92	66.92	66.92	66.92	(66)

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

(67)m=	10.75	9.54	7.76	5.88	4.39	3.71	4.01	5.21	6.99	8.88	10.36	11.04	(67)

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

(68)m=	114.98	116.17	113.17	106.77	98.69	91.09	86.02	84.83	87.83	94.23	102.31	109.91	(68)

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

(69)m=	29.69	29.69	29.69	29.69	29.69	29.69	29.69	29.69	29.69	29.69	29.69	29.69	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-53.53	-53.53	-53.53	-53.53	-53.53	-53.53	-53.53	-53.53	-53.53	-53.53	-53.53	-53.53	(71)

Water heating gains (Table 5)

(72)m=	99.58	98.05	94.89	90.59	87.79	83.86	80.51	84.8	86.32	90.77	95.8	98.06	(72)

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

(73)m=	268.38	266.85	258.89	246.3	233.95	221.73	213.62	217.91	224.22	236.96	251.55	262.09	(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	5.19	x	11.28	x	0.85	x	0.7	=	24.15	(75)
Northeast 0.9x	0.77	x	5.19	x	22.97	x	0.85	x	0.7	=	49.15	(75)
Northeast 0.9x	0.77	x	5.19	x	41.38	x	0.85	x	0.7	=	88.55	(75)
Northeast 0.9x	0.77	x	5.19	x	67.96	x	0.85	x	0.7	=	145.43	(75)
Northeast 0.9x	0.77	x	5.19	x	91.35	x	0.85	x	0.7	=	195.48	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	5.19	x	97.38	x	0.85	x	0.7	=	208.4	(75)
Northeast	0.9x	0.77	x	5.19	x	91.1	x	0.85	x	0.7	=	194.96	(75)
Northeast	0.9x	0.77	x	5.19	x	72.63	x	0.85	x	0.7	=	155.42	(75)
Northeast	0.9x	0.77	x	5.19	x	50.42	x	0.85	x	0.7	=	107.9	(75)
Northeast	0.9x	0.77	x	5.19	x	28.07	x	0.85	x	0.7	=	60.06	(75)
Northeast	0.9x	0.77	x	5.19	x	14.2	x	0.85	x	0.7	=	30.38	(75)
Northeast	0.9x	0.77	x	5.19	x	9.21	x	0.85	x	0.7	=	19.72	(75)

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

(83)m=	24.15	49.15	88.55	145.43	195.48	208.4	194.96	155.42	107.9	60.06	30.38	19.72	(83)

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

(84)m=	292.52	316	347.44	391.73	429.43	430.14	408.57	373.33	332.12	297.02	281.93	281.8	(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=	0.99	0.99	0.98	0.96	0.91	0.79	0.65	0.71	0.89	0.97	0.99	0.99	(86)

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

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

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

(88)m=	19.34	19.35	19.36	19.4	19.41	19.45	19.45	19.45	19.43	19.41	19.39	19.38	(88)

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

(89)m=	0.99	0.99	0.98	0.94	0.86	0.67	0.46	0.52	0.82	0.96	0.99	0.99	(89)

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

(90)m=	19.34	19.35	19.36	19.4	19.41	19.45	19.45	19.45	19.43	19.41	19.39	19.38	(90)

fLA = Living area ÷ (4) = 0.86 (91)

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

(92)m=	20.77	20.77	20.77	20.78	20.78	20.78	20.78	20.78	20.78	20.78	20.77	20.77	(92)

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

(93)m=	20.77	20.77	20.77	20.78	20.78	20.78	20.78	20.78	20.78	20.78	20.77	20.77	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.98	0.96	0.9	0.77	0.63	0.69	0.89	0.97	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	290.62	313.1	341.68	376.15	386.55	332.37	255.72	255.94	294.17	288.58	279.07	280.21	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1223.1	1170.56	1045.52	842.32	639.82	423.16	286.25	298.35	462.49	717.36	976.04	1198.21	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	693.77	576.22	523.66	335.64	188.43	0	0	0	0	319.01	501.82	682.99	

DER WorkSheet: New dwelling design stage

Total per year (kWh/year) = Sum(98)1...5,9...12 =	3821.53	(98)
Space heating requirement in kWh/m²/year	102.26	(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		249.28	(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)	693.77	576.22	523.66	335.64	188.43	0	0	0	0	319.01	501.82	682.99		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	278.31	231.16	210.07	134.65	75.59	0	0	0	0	127.98	201.31	273.99		(211)
Total (kWh/year) =Sum(211)1...5,10...12=													1533.06	(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		
Output from water heater (calculated above)	155.51	137.38	145.02	131.02	129.14	116.45	112.85	122.44	121.79	135.81	142.32	152.11		
Efficiency of water heater													178.12	(216)
(217)m=	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	87.3	77.13	81.41	73.56	72.5	65.38	63.36	68.74	68.37	76.24	79.9	85.4		
Total = Sum(219a)1...12 =													899.28	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1533.06	
Water heating fuel used			899.28	
Electricity for pumps, fans and electric keep-hot				
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		0	(231)
Electricity for lighting			189.76	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			2622.1	(338)

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	=	795.66	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)

DER WorkSheet: New dwelling design stage

Water heating	(219) x	0.519	=	466.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1262.38	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	98.49	(268)
Total CO2, kg/year		sum of (265)…(271) =		1360.87	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		36.42	(273)
EI rating (section 14)				78	(274)