

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.57
Printed on 20 October 2022 at 10:29:04

Project Information:

Assessed By: Neil Ingham (STRO010943)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 88.06m²

Site Reference : 807 High Street - LEAN

Plot Reference: Sample 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: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.54 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 61.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 48.3 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	N/A
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6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat	
	No cylinder	
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

Continuous extract system		
Specific fan power:	0.6	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North	11.15m ²	
Windows facing: East	5.96m ²	
Ventilation rate:	6.00	

10 Key features

Air permeability	3.0 m ³ /m ² h
Windows U-value	1.1 W/m ² K
Doors U-value	1.1 W/m ² K
Party Walls U-value	0 W/m ² K

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name: Neil Ingham **Stroma Number:** STRO010943
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.57

Property Address: Sample 1

Address :

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	88.06 (1a)	2.7 (2a)	237.76 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	88.06 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	237.76 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				3	30 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.13 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.38 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.38 (21)

Infiltration rate modified for monthly wind speed

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

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

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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

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

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

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

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

(24d)m= 0.62 0.61 0.61 0.59 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 (24d)

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

(25)m= 0.62 0.61 0.61 0.59 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 (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			1.95	x 1	= 1.95		(26)
Windows Type 1			11.15	x1/[1/(1.4)+0.04]	= 14.78		(27)
Windows Type 2			5.96	x1/[1/(1.4)+0.04]	= 7.9		(27)
Floor			88.06	x 0.13	= 11.4478		(28)
Walls Type1	55.67	17.11	38.56	x 0.18	= 6.94		(29)
Walls Type2	39.02	1.95	37.07	x 0.18	= 6.67		(29)
Total area of elements, m²			182.75				(31)
Party wall			16.66	x 0	= 0		(32)
Party ceiling			88.06				(32b)
Internal wall **			191.81				(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 49.69 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 16260.09 (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 12.26 (36)

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

Total fabric heat loss (33) + (36) = 61.96 (37)

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

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

48.26	47.9	47.56	45.95	45.65	44.24	44.24	43.98	44.78	45.65	46.26	46.9
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 (38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

110.21	109.86	109.52	107.91	107.6	106.2	106.2	105.94	106.74	107.6	108.21	108.85
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Average = Sum(39)_{1...12} /12=

107.9

 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.25	1.25	1.24	1.23	1.22	1.21	1.21	1.2	1.21	1.22	1.23	1.24
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Average = Sum(40)_{1...12} /12=

1.23

 (40)

Number of days in month (Table 1a)

(41)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

 (41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

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

2.6

 (42)

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

95.91

 (43)

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

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

(44)m=

105.5	101.66	97.83	93.99	90.15	86.32	86.32	90.15	93.99	97.83	101.66	105.5
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Total = Sum(44)_{1...12} =

1150.89

 (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=

156.45	136.83	141.2	123.1	118.12	101.93	94.45	108.38	109.68	127.82	139.52	151.51
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Total = Sum(45)_{1...12} =

1509

 (45)

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

(46)m=

23.47	20.53	21.18	18.47	17.72	15.29	14.17	16.26	16.45	19.17	20.93	22.73
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 (46)

Water storage loss:

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

0

 (47)

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

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

Water storage loss:

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

0

 (48)

Temperature factor from Table 2b

0

 (49)

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

0

 (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

 (55)

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

(56)m=

0	0	0	0	0	0	0	0	0	0	0	0
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 (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=

0	0	0	0	0	0	0	0	0	0	0	0
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 (57)

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Primary circuit loss (annual) from Table 3

0

(58)

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

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

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0
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(59)

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

(61)m=	50.96	46.03	49.85	46.35	45.94	42.57	43.99	45.94	46.35	49.85	49.32	50.96
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(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=	207.41	182.86	191.05	169.45	164.06	144.49	138.44	154.32	156.03	177.67	188.84	202.47
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(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
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(63)

FHRS	0	0	0	0	0	0	0	0	0	0	0	0
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(63) (G2)

Output from water heater

(64)m=	207.41	182.86	191.05	169.45	164.06	144.49	138.44	154.32	156.03	177.67	188.84	202.47
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Output from water heater (annual)_{1...12}

2077.1

(64)

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

(65)m=	64.76	57	59.41	52.52	50.76	44.53	42.4	47.52	48.06	54.96	58.72	63.12
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(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=	129.91	129.91	129.91	129.91	129.91	129.91	129.91	129.91	129.91	129.91	129.91	129.91

(66)

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

(67)m=	21.21	18.84	15.32	11.6	8.67	7.32	7.91	10.28	13.8	17.52	20.45	21.8
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(67)

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

(68)m=	235.46	237.91	231.75	218.64	202.09	186.54	176.15	173.71	179.87	192.98	209.52	225.07
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(68)

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

(69)m=	35.99	35.99	35.99	35.99	35.99	35.99	35.99	35.99	35.99	35.99	35.99	35.99
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(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-103.93	-103.93	-103.93	-103.93	-103.93	-103.93	-103.93	-103.93	-103.93	-103.93	-103.93	-103.93
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(71)

Water heating gains (Table 5)

(72)m=	87.04	84.83	79.85	72.94	68.23	61.85	56.99	63.87	66.74	73.87	81.56	84.84
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(72)

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

(73)m=	408.69	406.54	391.9	368.16	343.96	320.69	306.03	312.84	325.38	349.34	376.5	396.68
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(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)
North	0.9x	0.77	x	11.15	x	10.63	x	0.63	x	0.7	= 36.23 (74)

(74)

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North	0.9x	0.77	x	11.15	x	20.32	x	0.63	x	0.7	=	69.25	(74)
North	0.9x	0.77	x	11.15	x	34.53	x	0.63	x	0.7	=	117.66	(74)
North	0.9x	0.77	x	11.15	x	55.46	x	0.63	x	0.7	=	189	(74)
North	0.9x	0.77	x	11.15	x	74.72	x	0.63	x	0.7	=	254.6	(74)
North	0.9x	0.77	x	11.15	x	79.99	x	0.63	x	0.7	=	272.56	(74)
North	0.9x	0.77	x	11.15	x	74.68	x	0.63	x	0.7	=	254.47	(74)
North	0.9x	0.77	x	11.15	x	59.25	x	0.63	x	0.7	=	201.89	(74)
North	0.9x	0.77	x	11.15	x	41.52	x	0.63	x	0.7	=	141.47	(74)
North	0.9x	0.77	x	11.15	x	24.19	x	0.63	x	0.7	=	82.43	(74)
North	0.9x	0.77	x	11.15	x	13.12	x	0.63	x	0.7	=	44.7	(74)
North	0.9x	0.77	x	11.15	x	8.86	x	0.63	x	0.7	=	30.21	(74)
East	0.9x	0.77	x	5.96	x	19.64	x	0.63	x	0.7	=	35.77	(76)
East	0.9x	0.77	x	5.96	x	38.42	x	0.63	x	0.7	=	69.98	(76)
East	0.9x	0.77	x	5.96	x	63.27	x	0.63	x	0.7	=	115.25	(76)
East	0.9x	0.77	x	5.96	x	92.28	x	0.63	x	0.7	=	168.08	(76)
East	0.9x	0.77	x	5.96	x	113.09	x	0.63	x	0.7	=	205.99	(76)
East	0.9x	0.77	x	5.96	x	115.77	x	0.63	x	0.7	=	210.87	(76)
East	0.9x	0.77	x	5.96	x	110.22	x	0.63	x	0.7	=	200.76	(76)
East	0.9x	0.77	x	5.96	x	94.68	x	0.63	x	0.7	=	172.45	(76)
East	0.9x	0.77	x	5.96	x	73.59	x	0.63	x	0.7	=	134.04	(76)
East	0.9x	0.77	x	5.96	x	45.59	x	0.63	x	0.7	=	83.04	(76)
East	0.9x	0.77	x	5.96	x	24.49	x	0.63	x	0.7	=	44.61	(76)
East	0.9x	0.77	x	5.96	x	16.15	x	0.63	x	0.7	=	29.42	(76)

Solar gains in watts, calculated for each month

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

(83)m=	72.01	139.23	232.91	357.08	460.59	483.43	455.22	374.33	275.51	165.47	89.31	59.63	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	480.7	545.77	624.81	725.24	804.56	804.11	761.25	687.17	600.89	514.81	465.81	456.31	(84)
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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	1	0.99	0.97	0.9	0.75	0.59	0.66	0.9	0.99	1	1	(86)

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

(87)m=	19.58	19.72	19.99	20.37	20.71	20.92	20.98	20.97	20.79	20.36	19.91	19.56	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.88	19.88	19.89	19.9	19.9	19.92	19.92	19.92	19.91	19.9	19.9	19.89	(88)
--------	-------	-------	-------	------	------	-------	-------	-------	-------	------	------	-------	------

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

(89)m=	1	1	0.99	0.96	0.86	0.66	0.46	0.53	0.84	0.98	1	1	(89)
--------	---	---	------	------	------	------	------	------	------	------	---	---	------

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

(90)m=	17.98	18.19	18.58	19.14	19.61	19.86	19.91	19.9	19.73	19.14	18.48	17.97	(90)
--------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.32 (91)

TER WorkSheet: New dwelling design stage

Mean internal temperature (for the whole dwelling) = $f_{LA} \times T_1 + (1 - f_{LA}) \times T_2$

(92)m=	18.5	18.69	19.04	19.54	19.97	20.21	20.26	20.25	20.08	19.53	18.94	18.48	(92)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.5	18.69	19.04	19.54	19.97	20.21	20.26	20.25	20.08	19.53	18.94	18.48	(93)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

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

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

Utilisation factor for gains, h_m :

(94)m=	1	0.99	0.99	0.96	0.87	0.69	0.5	0.57	0.85	0.98	0.99	1	(94)
--------	---	------	------	------	------	------	-----	------	------	------	------	---	------

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

(95)m=	479.4	542.91	616.45	693.26	696.83	551.66	380.81	393.87	511.95	502.45	463.42	455.35	(95)
--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

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

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

(97)m=	1564.86	1514.52	1373.16	1148.27	889.79	595.27	388.27	407.72	637.99	961.15	1281.5	1554.63	(97)
--------	---------	---------	---------	---------	--------	--------	--------	--------	--------	--------	--------	---------	------

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

(98)m=	807.59	652.92	562.99	327.61	143.56	0	0	0	0	341.27	589.02	817.87	
Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$												4242.83	(98)

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

48.18	(99)
-------	------

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

Space heating:

Fraction of space heat from secondary/supplementary system

0	(201)
---	-------

Fraction of space heat from main system(s)

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

1	(202)
---	-------

Fraction of total heating from main system 1

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

1	(204)
---	-------

Efficiency of main space heating system 1

93.4	(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)

807.59	652.92	562.99	327.61	143.56	0	0	0	0	341.27	589.02	817.87
--------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------

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

864.65	699.06	602.77	350.76	153.7	0	0	0	0	365.39	630.64	875.66
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

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

4542.64	(211)
---------	-------

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

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

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

Water heating

Output from water heater (calculated above)

207.41	182.86	191.05	169.45	164.06	144.49	138.44	154.32	156.03	177.67	188.84	202.47
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Efficiency of water heater

80.3	(216)
------	-------

(217)m=	88.13	87.98	87.61	86.68	84.72	80.3	80.3	80.3	80.3	86.67	87.72	88.2	(217)
---------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	------	-------

Fuel for water heating, $kWh/month$

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

(219)m=	235.33	207.85	218.07	195.48	193.66	179.94	172.4	192.19	194.31	205	215.27	229.57	
Total = $Sum(219a)_{1...12} =$												2439.07	(219)

TER WorkSheet: New dwelling design stage

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		4542.64
Water heating fuel used		2439.07
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75 (231)
Electricity for lighting		374.56 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		7431.27 (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	0.216	=	981.21 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.216	=	526.84 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1508.05 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93 (267)
Electricity for lighting	(232) x	0.519	=	194.39 (268)
Total CO2, kg/year		sum of (265)...(271) =		1741.37 (272)
TER =				19.77 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.57
Printed on 20 October 2022 at 10:29:04

Project Information:

Assessed By: Neil Ingham (STRO010943)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 79.71m²

Site Reference : 807 High Street - LEAN

Plot Reference: Sample 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: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.58 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.60 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 44.2 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.07 (max. 0.25)	0.07 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	N/A
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Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat	
	No cylinder	
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

Continuous extract system		
Specific fan power:	0.6	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	9.29m ²	
Windows facing: South East	7.52m ²	
Ventilation rate:	8.00	

10 Key features

Air permeability	3.0 m ³ /m ² h
Windows U-value	1.1 W/m ² K
Doors U-value	1.1 W/m ² K
Roofs U-value	0.12 W/m ² K
Party Walls U-value	0 W/m ² K
Floors U-value	0.07 W/m ² K

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name: Neil Ingham **Stroma Number:** STRO010943
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.57

Property Address: Sample 2

Address :

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	44.41 (1a)	x	2.7 (2a)	=	119.91 (3a)
First floor	35.3 (1b)	x	3.23 (2b)	=	114.02 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.71 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	233.93 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				3	30 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.13 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0 (11)
<i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			
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)			0.38 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.38 (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
--------	-----	---	-----	-----	-----	-----	-----	-----	---	-----	-----	-----

TER 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

	0.48	0.47	0.46	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.44
--	------	------	------	------	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

(23a)

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

(23b)

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

(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= 0.62 0.61 0.61 0.59 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 (24d)

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

(25)m= 0.62 0.61 0.61 0.59 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 (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			1.95	x 1.2	= 2.34		(26)
Windows Type 1			9.29	x 1/[1/(1.4) + 0.04]	= 12.32		(27)
Windows Type 2			7.52	x 1/[1/(1.4) + 0.04]	= 9.97		(27)
Floor			44.41	x 0.13	= 5.7733		(28)
Walls	58.83	18.76	40.07	x 0.18	= 7.21		(29)
Roof Type1	3.92	0	3.92	x 0.13	= 0.51		(30)
Roof Type2	35.67	0	35.67	x 0.13	= 4.64		(30)
Total area of elements, m²			142.83				(31)
Party wall			101.47	x 0	= 0		(32)
Internal wall **			123.2				(32c)
Internal floor			35.3				(32d)
Internal ceiling			35.3				(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) = 42.76 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 12719.31 (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

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can be used instead of a detailed calculation.

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

10.99 (36)

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

Total fabric heat loss

(33) + (36) =

53.75 (37)

Ventilation heat loss calculated monthly

(38)m = 0.33 x (25)m x (5)

(38)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
47.57	47.23	46.88	45.28	44.98	43.58	43.58	43.32	44.12	44.98	45.59	46.22

(38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

101.32	100.97	100.63	99.03	98.73	97.33	97.33	97.07	97.87	98.73	99.33	99.97
--------	--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------

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

99.03 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.27	1.27	1.26	1.24	1.24	1.22	1.22	1.22	1.23	1.24	1.25	1.25
------	------	------	------	------	------	------	------	------	------	------	------

Average = Sum(40)_{1...12} /12=

1.24 (40)

Number of days in month (Table 1a)

(41)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.46

(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

92.56

(43)

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

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

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

(44)m=

101.82	98.12	94.41	90.71	87.01	83.31	83.31	87.01	90.71	94.41	98.12	101.82
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------

Total = Sum(44)_{1...12} =

1110.74 (44)

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

(45)m=

150.99	132.06	136.27	118.81	114	98.37	91.16	104.6	105.85	123.36	134.66	146.23
--------	--------	--------	--------	-----	-------	-------	-------	--------	--------	--------	--------

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

1456.36 (45)

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

(46)m=

22.65	19.81	20.44	17.82	17.1	14.76	13.67	15.69	15.88	18.5	20.2	21.93
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(46)

Water storage loss:

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

0

(47)

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

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

Water storage loss:

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

0

(48)

Temperature factor from Table 2b

0

(49)

Energy lost from water storage, kWh/year

(48) x (49) =

0

(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)

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

0
0

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

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

(56)m=

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

(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=

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

(57)

Primary circuit loss (annual) from Table 3

0

(58)

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

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

(59)m=

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

(59)

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

(61)m=

50.96	45.16	48.11	44.73	44.34	41.08	42.45	44.34	44.73	48.11	48.39	50.96
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(61)

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

(62)m=

201.95	177.22	184.39	163.54	158.34	139.45	133.61	148.94	150.59	171.47	183.04	197.19
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(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)

FHRS

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

(63) (G2)

Output from water heater

(64)m=

201.95	177.22	184.39	163.54	158.34	139.45	133.61	148.94	150.59	171.47	183.04	197.19
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

2009.72

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

(65)m=

62.94	55.2	57.34	50.69	48.99	42.98	40.92	45.86	46.38	53.05	56.87	61.36
-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(65)

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

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

Metabolic gains (Table 5), Watts

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
122.87	122.87	122.87	122.87	122.87	122.87	122.87	122.87	122.87	122.87	122.87	122.87

(66)

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

(67)m=

19.51	17.33	14.09	10.67	7.97	6.73	7.27	9.46	12.69	16.12	18.81	20.05
-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------

(67)

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

(68)m=

218.83	221.1	215.38	203.2	187.82	173.37	163.71	161.44	167.16	179.35	194.72	209.18
--------	-------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

(68)

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

(69)m=

35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(69)

Pumps and fans gains (Table 5a)

(70)m=

3	3	3	3	3	3	3	3	3	3	3	3
---	---	---	---	---	---	---	---	---	---	---	---

(70)

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

(71)m=

-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

Water heating gains (Table 5)

(72)m=

84.6	82.14	77.07	70.4	65.85	59.69	55	61.65	64.42	71.3	78.99	82.47
------	-------	-------	------	-------	-------	----	-------	-------	------	-------	-------

(72)

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

(73)m=

385.81	383.43	369.4	347.13	324.5	302.65	288.85	295.4	307.13	329.62	355.38	374.56
--------	--------	-------	--------	-------	--------	--------	-------	--------	--------	--------	--------

(73)

TER WorkSheet: New dwelling design stage

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)
Southeast 0.9x	0.77	x	7.52	x	36.79	x	0.63	x	0.7	=	84.56 (77)
Southeast 0.9x	0.77	x	7.52	x	62.67	x	0.63	x	0.7	=	144.04 (77)
Southeast 0.9x	0.77	x	7.52	x	85.75	x	0.63	x	0.7	=	197.08 (77)
Southeast 0.9x	0.77	x	7.52	x	106.25	x	0.63	x	0.7	=	244.19 (77)
Southeast 0.9x	0.77	x	7.52	x	119.01	x	0.63	x	0.7	=	273.51 (77)
Southeast 0.9x	0.77	x	7.52	x	118.15	x	0.63	x	0.7	=	271.53 (77)
Southeast 0.9x	0.77	x	7.52	x	113.91	x	0.63	x	0.7	=	261.79 (77)
Southeast 0.9x	0.77	x	7.52	x	104.39	x	0.63	x	0.7	=	239.91 (77)
Southeast 0.9x	0.77	x	7.52	x	92.85	x	0.63	x	0.7	=	213.39 (77)
Southeast 0.9x	0.77	x	7.52	x	69.27	x	0.63	x	0.7	=	159.19 (77)
Southeast 0.9x	0.77	x	7.52	x	44.07	x	0.63	x	0.7	=	101.28 (77)
Southeast 0.9x	0.77	x	7.52	x	31.49	x	0.63	x	0.7	=	72.37 (77)
Northwest 0.9x	0.77	x	9.29	x	11.28	x	0.63	x	0.7	=	32.03 (81)
Northwest 0.9x	0.77	x	9.29	x	22.97	x	0.63	x	0.7	=	65.21 (81)
Northwest 0.9x	0.77	x	9.29	x	41.38	x	0.63	x	0.7	=	117.48 (81)
Northwest 0.9x	0.77	x	9.29	x	67.96	x	0.63	x	0.7	=	192.94 (81)
Northwest 0.9x	0.77	x	9.29	x	91.35	x	0.63	x	0.7	=	259.34 (81)
Northwest 0.9x	0.77	x	9.29	x	97.38	x	0.63	x	0.7	=	276.49 (81)
Northwest 0.9x	0.77	x	9.29	x	91.1	x	0.63	x	0.7	=	258.65 (81)
Northwest 0.9x	0.77	x	9.29	x	72.63	x	0.63	x	0.7	=	206.2 (81)
Northwest 0.9x	0.77	x	9.29	x	50.42	x	0.63	x	0.7	=	143.15 (81)
Northwest 0.9x	0.77	x	9.29	x	28.07	x	0.63	x	0.7	=	79.69 (81)
Northwest 0.9x	0.77	x	9.29	x	14.2	x	0.63	x	0.7	=	40.31 (81)
Northwest 0.9x	0.77	x	9.29	x	9.21	x	0.63	x	0.7	=	26.16 (81)

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

(83)m=	116.59	209.24	314.56	437.12	532.86	548.02	520.44	446.11	356.54	238.88	141.59	98.53	(83)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	------

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

(84)m=	502.4	592.68	683.96	784.25	857.36	850.68	809.29	741.51	663.68	568.5	496.97	473.09	(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	0.85	0.68	0.52	0.58	0.83	0.97	0.99	1	(86)

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

(87)m=	19.63	19.8	20.09	20.47	20.78	20.95	20.99	20.98	20.86	20.45	19.97	19.6	(87)
--------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------	------

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

(88)m=	19.86	19.87	19.87	19.89	19.89	19.9	19.9	19.91	19.9	19.89	19.88	19.88	(88)
--------	-------	-------	-------	-------	-------	------	------	-------	------	-------	-------	-------	------

TER WorkSheet: New dwelling design stage

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

(89)m=	1	0.99	0.98	0.93	0.8	0.58	0.39	0.45	0.76	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=	18.05	18.31	18.73	19.28	19.68	19.87	19.9	19.9	19.79	19.26	18.57	18.02	(90)
--------	-------	-------	-------	-------	-------	-------	------	------	-------	-------	-------	-------	------

$$fLA = \text{Living area} \div (4) = 0.43 \quad (91)$$

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

(92)m=	18.72	18.95	19.31	19.79	20.15	20.33	20.37	20.36	20.25	19.77	19.17	18.7	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------	------

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

(93)m=	18.72	18.95	19.31	19.79	20.15	20.33	20.37	20.36	20.25	19.77	19.17	18.7	(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	0.97	0.93	0.81	0.62	0.45	0.51	0.78	0.96	0.99	1	(94)
--------	---	------	------	------	------	------	------	------	------	------	------	---	------

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	500.07	586.7	666.83	727.65	698.28	530.04	362.02	376.54	520.13	543.42	492.36	471.42	(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=	1461.5	1418.58	1289.36	1078.46	834.65	557.9	366.58	384.64	601.5	905.17	1198.95	1449.6	(97)
--------	--------	---------	---------	---------	--------	-------	--------	--------	-------	--------	---------	--------	------

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

(98)m=	715.3	559.03	463.16	252.58	101.46	0	0	0	0	269.14	508.74	727.76	(98)
--------	-------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------	------

$$\text{Total per year (kWh/year)} = \text{Sum}(98)_{1..5,9..12} = 3597.18 \quad (98)$$

Space heating requirement in kWh/m²/year

$$45.13 \quad (99)$$

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

Space heating:

Fraction of space heat from secondary/supplementary system

$$0 \quad (201)$$

Fraction of space heat from main system(s)

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

$$1 \quad (202)$$

Fraction of total heating from main system 1

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

$$1 \quad (204)$$

Efficiency of main space heating system 1

$$93.4 \quad (206)$$

Efficiency of secondary/supplementary heating system, %

$$0 \quad (208)$$

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

Space heating requirement (calculated above)

715.3	559.03	463.16	252.58	101.46	0	0	0	0	269.14	508.74	727.76
-------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------

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

765.85	598.53	495.89	270.43	108.63	0	0	0	0	288.16	544.69	779.19
--------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------

$$\text{Total (kWh/year)} = \text{Sum}(211)_{1..5,10..12} = 3851.37 \quad (211)$$

Space heating fuel (secondary), kWh/month

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

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

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

TER WorkSheet: New dwelling design stage

Water heating

Output from water heater (calculated above)

201.95	177.22	184.39	163.54	158.34	139.45	133.61	148.94	150.59	171.47	183.04	197.19
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Efficiency of water heater

80.3 (216)

(217)m= 87.96 87.74 87.27 86.14 83.96 80.3 80.3 80.3 80.3 86.18 87.49 88.04 (217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	229.58	201.97	211.27	189.85	188.58	173.67	166.38	185.48	187.53	198.97	209.22	223.98
---------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

2366.48 (219)

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

3851.37

Water heating fuel used

2366.48

Electricity for pumps, fans and electric keep-hot

central heating pump:

30 (230c)

boiler with a fan-assisted flue

45 (230e)

Total electricity for the above, kWh/year

sum of (230a)...(230g) =

75 (231)

Electricity for lighting

344.54 (232)

Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =

6637.39 (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	0.216	=	831.9 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.216	=	511.16 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1343.06 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93 (267)
Electricity for lighting	(232) x	0.519	=	178.82 (268)
Total CO2, kg/year		sum of (265)...(271) =		1560.8 (272)

TER = 19.58 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.57
Printed on 20 October 2022 at 10:29:03

Project Information:

Assessed By: Neil Ingham (STRO010943)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 50.84m²

Site Reference : 807 High Street - LEAN

Plot Reference: Sample 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: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 20.85 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.75 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 42.4 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	N/A
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Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat	
	No cylinder	
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

Continuous extract system		
Specific fan power:	0.65	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: East	9.58m ²	
Ventilation rate:	4.00	

10 Key features

Air permeability	3.0 m ³ /m ² h
Windows U-value	1.1 W/m ² K
Doors U-value	1.1 W/m ² K
Roofs U-value	0.12 W/m ² K
Party Walls U-value	0 W/m ² K

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name: Neil Ingham **Stroma Number:** STRO010943
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.57

Property Address: Sample 3

Address :

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	50.84 (1a)	2.7 (2a)	137.27 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	50.84 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	137.27 (5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.15 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.4 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.4 (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
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TER WorkSheet: New dwelling design stage

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

0.5	0.49	0.48	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.46
-----	------	------	------	------	------	------	------	-----	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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

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

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

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

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

(24d)m= 0.63 0.62 0.62 0.59 0.59 0.57 0.57 0.57 0.58 0.59 0.6 0.61 (24d)

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

(25)m= 0.63 0.62 0.62 0.59 0.59 0.57 0.57 0.57 0.58 0.59 0.6 0.61 (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			1.95	x 1	= 1.95		(26)
Windows			9.58	x1/[1/(1.4)+0.04]	= 12.7		(27)
Floor			9.71	x 0.13	= 1.2623		(28)
Walls Type1	25.8	9.58	16.22	x 0.18	= 2.92		(29)
Walls Type2	11.85	1.95	9.9	x 0.18	= 1.78		(29)
Roof	14.09	0	14.09	x 0.13	= 1.83		(30)
Total area of elements, m²			61.45				(31)
Party wall			48.84	x 0	= 0		(32)
Party floor			41.13				(32a)
Party ceiling			36.75				(32b)
Internal wall **			77.44				(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 22.45 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 7530.67 (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 11.12 (36)

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

Total fabric heat loss (33) + (36) = 33.56 (37)

TER WorkSheet: New dwelling design stage

Ventilation heat loss calculated monthly

$$(38)m = 0.33 \times (25)m \times (5)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	28.41	28.19	27.97	26.94	26.75	25.85	25.85	25.68	26.2	26.75	27.14	27.55	(38)

Heat transfer coefficient, W/K

$$(39)m = (37) + (38)m$$

(39)m=	61.98	61.75	61.53	60.5	60.31	59.41	59.41	59.25	59.76	60.31	60.7	61.11	
Average = Sum(39) _{1...12} /12=												60.5	(39)

Heat loss parameter (HLP), W/m²K

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

(40)m=	1.22	1.21	1.21	1.19	1.19	1.17	1.17	1.17	1.18	1.19	1.19	1.2	
Average = Sum(40) _{1...12} /12=												1.19	(40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

$$\text{if TFA} > 13.9, N = 1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)^2)] + 0.0013 \times (TFA - 13.9)$$

$$\text{if TFA} \leq 13.9, N = 1$$

Annual average hot water usage in litres per day $V_{d, \text{average}} = (25 \times N) + 36$

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	82.42	79.42	76.43	73.43	70.43	67.43	67.43	70.43	73.43	76.43	79.42	82.42	
Total = Sum(44) _{1...12} =												899.13	(44)

Energy content of hot water used - calculated monthly = $4.190 \times V_{d,m} \times n_m \times DT_m / 3600$ kWh/month (see Tables 1b, 1c, 1d)

(45)m=	122.23	106.9	110.31	96.17	92.28	79.63	73.79	84.67	85.69	99.86	109	118.37	
Total = Sum(45) _{1...12} =												1178.91	(45)

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

(46)m=	18.33	16.04	16.55	14.43	13.84	11.94	11.07	12.7	12.85	14.98	16.35	17.76	(46)
--------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------

Water storage loss:

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

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

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

Water storage loss:

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

Temperature factor from Table 2b

Energy lost from water storage, kWh/year

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

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

If community heating see section 4.3

Volume factor from Table 2a

Temperature factor from Table 2b

Energy lost from water storage, kWh/year

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

Water storage loss calculated for each month

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)
--------	---	---	---	---	---	---	---	---	---	---	---	---	------

TER WorkSheet: New dwelling design stage

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

(57)m=

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

 (57)

Primary circuit loss (annual) from Table 3

0

 (58)

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

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

(59)m=

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

 (59)

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

(61)m=

42	36.56	38.95	36.21	35.89	33.26	34.36	35.89	36.21	38.95	39.17	42
----	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	----

 (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=

164.23	143.46	149.26	132.38	128.17	112.89	108.15	120.57	121.9	138.8	148.17	160.37
--------	--------	--------	--------	--------	--------	--------	--------	-------	-------	--------	--------

 (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)

FHRS

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

 (63) (G2)

Output from water heater

(64)m=

164.23	143.46	149.26	132.38	128.17	112.89	108.15	120.57	121.9	138.8	148.17	160.37
--------	--------	--------	--------	--------	--------	--------	--------	-------	-------	--------	--------

Output from water heater (annual) ^{1...12}	1628.35
---	---------

 (64)

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

(65)m=

51.14	44.68	46.42	41.03	39.66	34.79	33.13	37.13	37.54	42.94	46.04	49.86
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (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

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
85.74	85.74	85.74	85.74	85.74	85.74	85.74	85.74	85.74	85.74	85.74	85.74

 (66)

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

(67)m=

13.51	12	9.76	7.39	5.52	4.66	5.04	6.55	8.79	11.16	13.03	13.89
-------	----	------	------	------	------	------	------	------	-------	-------	-------

 (67)

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

(68)m=

149.42	150.97	147.06	138.74	128.24	118.37	111.78	110.23	114.14	122.45	132.95	142.82
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (68)

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

(69)m=

31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (69)

Pumps and fans gains (Table 5a)

(70)m=

3	3	3	3	3	3	3	3	3	3	3	3
---	---	---	---	---	---	---	---	---	---	---	---

 (70)

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

(71)m=

-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (71)

Water heating gains (Table 5)

(72)m=

68.74	66.49	62.39	56.99	53.3	48.32	44.52	49.9	52.14	57.71	63.94	67.01
-------	-------	-------	-------	------	-------	-------	------	-------	-------	-------	-------

 (72)

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

(73)m=

283.39	281.18	270.93	254.84	238.79	223.08	213.07	218.4	226.79	243.05	261.64	275.45
--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------

 (73)

6. Solar gains:

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

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d			Area m ²	Flux Table 6a			g_ Table 6b	FF Table 6c			Gains (W)	
East	0.9x	0.77	x	9.58	x	19.64	x	0.63	x	0.7	=	57.5	(76)
East	0.9x	0.77	x	9.58	x	38.42	x	0.63	x	0.7	=	112.49	(76)
East	0.9x	0.77	x	9.58	x	63.27	x	0.63	x	0.7	=	185.25	(76)
East	0.9x	0.77	x	9.58	x	92.28	x	0.63	x	0.7	=	270.18	(76)
East	0.9x	0.77	x	9.58	x	113.09	x	0.63	x	0.7	=	331.11	(76)
East	0.9x	0.77	x	9.58	x	115.77	x	0.63	x	0.7	=	338.95	(76)
East	0.9x	0.77	x	9.58	x	110.22	x	0.63	x	0.7	=	322.69	(76)
East	0.9x	0.77	x	9.58	x	94.68	x	0.63	x	0.7	=	277.19	(76)
East	0.9x	0.77	x	9.58	x	73.59	x	0.63	x	0.7	=	215.45	(76)
East	0.9x	0.77	x	9.58	x	45.59	x	0.63	x	0.7	=	133.47	(76)
East	0.9x	0.77	x	9.58	x	24.49	x	0.63	x	0.7	=	71.7	(76)
East	0.9x	0.77	x	9.58	x	16.15	x	0.63	x	0.7	=	47.29	(76)

Solar gains in watts, calculated for each month

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

(83)m=	57.5	112.49	185.25	270.18	331.11	338.95	322.69	277.19	215.45	133.47	71.7	47.29	(83)
--------	------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------	-------	------

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

(84)m=	340.89	393.67	456.18	525.01	569.9	562.03	535.76	495.59	442.25	376.53	333.34	322.73	(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)

(86)m=	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(86)
	1	0.99	0.98	0.94	0.82	0.64	0.48	0.54	0.8	0.97	0.99	1	

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

(87)m=	19.73	19.9	20.19	20.56	20.83	20.96	20.99	20.99	20.89	20.52	20.06	19.71	(87)
--------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(88)m=	19.9	19.91	19.91	19.93	19.93	19.95	19.95	19.95	19.94	19.93	19.92	19.92	(88)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	1	0.99	0.97	0.91	0.77	0.55	0.37	0.42	0.72	0.95	0.99	1	(89)
--------	---	------	------	------	------	------	------	------	------	------	------	---	------

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

(90)m=	18.23	18.47	18.89	19.42	19.77	19.92	19.94	19.94	19.86	19.38	18.72	18.21	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.45 (91)

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

(92)m=	18.91	19.12	19.48	19.94	20.25	20.39	20.42	20.42	20.33	19.89	19.33	18.89	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.91	19.12	19.48	19.94	20.25	20.39	20.42	20.42	20.33	19.89	19.33	18.89	(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

(94)m=	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
	0.99	0.99	0.97	0.91	0.79	0.59	0.42	0.47	0.75	0.95	0.99	1	

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Useful gains, hmGm , W = (94)m x (84)m

(95)m=	338.92	389.05	442.53	479.31	448.35	331.86	225	234.69	332.9	357.1	329.61	321.28	(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=	905.4	878.03	798.6	667.77	515.85	344.24	226.85	237.95	372.11	560.52	742.25	897.52	(97)
--------	-------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

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

(98)m=	421.46	328.59	264.91	135.69	50.23	0	0	0	0	151.34	297.1	428.72	
--------	--------	--------	--------	--------	-------	---	---	---	---	--------	-------	--------	--

Total per year (kWh/year) = Sum(98)_{1...5,9...12} = 2078.05 (98)

Space heating requirement in kWh/m²/year

40.87 (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

93.4 (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)

421.46	328.59	264.91	135.69	50.23	0	0	0	0	151.34	297.1	428.72
--------	--------	--------	--------	-------	---	---	---	---	--------	-------	--------

(211)m = {[(98)m x (204)] } x 100 ÷ (206)

(211)

451.24	351.81	283.63	145.28	53.77	0	0	0	0	162.04	318.1	459.01
--------	--------	--------	--------	-------	---	---	---	---	--------	-------	--------

Total (kWh/year) =Sum(211)_{1...5,10...12} = 2224.89 (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)

164.23	143.46	149.26	132.38	128.17	112.89	108.15	120.57	121.9	138.8	148.17	160.37
--------	--------	--------	--------	--------	--------	--------	--------	-------	-------	--------	--------

Efficiency of water heater

80.3 (216)

(217)m=	87.32	87.07	86.48	85.11	82.91	80.3	80.3	80.3	80.3	85.27	86.77	87.41	(217)
---------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	188.08	164.76	172.59	155.54	154.59	140.58	134.69	150.14	151.8	162.78	170.77	183.48	
Total = Sum(219a) _{1...12} =													1929.8 (219)

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

2224.89

Water heating fuel used

1929.8

Electricity for pumps, fans and electric keep-hot

central heating pump:

30 (230c)

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boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		238.63	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4468.32	(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		0.216	=	480.58	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	416.84	(264)
Space and water heating	(261) + (262) + (263) + (264) =				897.41	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	123.85	(268)
Total CO2, kg/year		sum of (265)...(271) =			1060.19	(272)
TER =					20.85	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.57
Printed on 20 October 2022 at 10:29:03

Project Information:

Assessed By: Neil Ingham (STRO010943)

Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 57.67m²

Site Reference : 807 High Street - LEAN

Plot Reference: Sample 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: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 23.45 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.83 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 70.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 54.2 kWh/m² **OK**

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	N/A
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Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat	
	No cylinder	
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

Continuous extract system		
Specific fan power:	0.65	
Maximum	0.7	OK

9 Summertime temperature

Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: East	7.27m ²	
Windows facing: North	7.6m ²	
Ventilation rate:	6.00	

10 Key features

Air permeability	3.0 m ³ /m ² h
Windows U-value	1.1 W/m ² K
Doors U-value	1.1 W/m ² K
Roofs U-value	0.12 W/m ² K
Party Walls U-value	0 W/m ² K

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name: Neil Ingham **Stroma Number:** STRO010943
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.57

Property Address: Sample 4

Address :

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	57.67 (1a)	3.05 (2a)	175.89 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	57.67 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	175.89 (5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.11 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i>			0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.36 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.36 (21)

Infiltration rate modified for monthly wind speed

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

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
---------	------	------	------	-----	------	------	------	------	---	------	------	------

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

0.46	0.45	0.45	0.4	0.39	0.35	0.35	0.34	0.36	0.39	0.41	0.43
------	------	------	-----	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			1.95	x 1	= 1.95		(26)
Windows Type 1			6.1	x1/[1/(1.4)+0.04]	= 8.09		(27)
Windows Type 2			6.37	x1/[1/(1.4)+0.04]	= 8.45		(27)
Walls Type1	62.23	12.47	49.76	x 0.18	= 8.96		(29)
Walls Type2	24.13	1.95	22.18	x 0.18	= 3.99		(29)
Roof	62.75	0	62.75	x 0.13	= 8.16		(30)
Total area of elements, m²			149.11				(31)
Party wall			18.83	x 0	= 0		(32)
Party floor			57.67				(32a)
Internal wall **			112.3				(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 39.59 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 9046 (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 8.67 (36)

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

Total fabric heat loss (33) + (36) = 48.26 (37)

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

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

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(38)m=

35.26	35.02	34.78	33.67	33.46	32.49	32.49	32.31	32.86	33.46	33.88	34.32
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

83.52	83.28	83.04	81.92	81.72	80.74	80.74	80.56	81.12	81.72	82.14	82.58
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

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

81.92

 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.45	1.44	1.44	1.42	1.42	1.4	1.4	1.4	1.41	1.42	1.42	1.43
------	------	------	------	------	-----	-----	-----	------	------	------	------

Average = Sum(40)_{1...12} /12=

1.42

 (40)

Number of days in month (Table 1a)

(41)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

 (41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

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

1.92

 (42)

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

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

79.68

 (43)

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

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

(44)m=

87.65	84.46	81.28	78.09	74.9	71.71	71.71	74.9	78.09	81.28	84.46	87.65
-------	-------	-------	-------	------	-------	-------	------	-------	-------	-------	-------

Total = Sum(44)_{1...12} =

956.19

 (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=

129.98	113.68	117.31	102.28	98.14	84.68	78.47	90.05	91.12	106.2	115.92	125.88
--------	--------	--------	--------	-------	-------	-------	-------	-------	-------	--------	--------

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

1253.71

 (45)

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

(46)m=

19.5	17.05	17.6	15.34	14.72	12.7	11.77	13.51	13.67	15.93	17.39	18.88
------	-------	------	-------	-------	------	-------	-------	-------	-------	-------	-------

 (46)

Water storage loss:

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

0

 (47)

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

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

Water storage loss:

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

0

 (48)

Temperature factor from Table 2b

0

 (49)

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

0

 (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

 (55)

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

(56)m=

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

 (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=

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

 (57)

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Primary circuit loss (annual) from Table 3

0

(58)

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

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

(59)m=

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

(59)

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

(61)m=

44.67	38.88	41.42	38.51	38.17	35.37	36.54	38.17	38.51	41.42	41.65	44.67
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=

174.65	152.56	158.73	140.78	136.3	120.05	115.02	128.22	129.63	147.61	157.57	170.55
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------

(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)

FHRS

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

(63) (G2)

Output from water heater

(64)m=

174.65	152.56	158.73	140.78	136.3	120.05	115.02	128.22	129.63	147.61	157.57	170.55
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------

Output from water heater (annual)_{1...12}

1731.68

(64)

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

(65)m=

54.39	47.52	49.36	43.63	42.17	37	35.23	39.48	39.93	45.66	48.96	53.02
-------	-------	-------	-------	-------	----	-------	-------	-------	-------	-------	-------

(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

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
95.75	95.75	95.75	95.75	95.75	95.75	95.75	95.75	95.75	95.75	95.75	95.75

(66)

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

(67)m=

14.91	13.24	10.77	8.15	6.09	5.14	5.56	7.23	9.7	12.31	14.37	15.32
-------	-------	-------	------	------	------	------	------	-----	-------	-------	-------

(67)

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

(68)m=

167.03	168.77	164.4	155.1	143.36	132.33	124.96	123.23	127.6	136.89	148.63	159.66
--------	--------	-------	-------	--------	--------	--------	--------	-------	--------	--------	--------

(68)

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

(69)m=

32.58	32.58	32.58	32.58	32.58	32.58	32.58	32.58	32.58	32.58	32.58	32.58
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(69)

Pumps and fans gains (Table 5a)

(70)m=

3	3	3	3	3	3	3	3	3	3	3	3
---	---	---	---	---	---	---	---	---	---	---	---

(70)

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

(71)m=

-76.6	-76.6	-76.6	-76.6	-76.6	-76.6	-76.6	-76.6	-76.6	-76.6	-76.6	-76.6
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(71)

Water heating gains (Table 5)

(72)m=

73.1	70.71	66.34	60.6	56.68	51.39	47.35	53.07	55.45	61.38	68	71.27
------	-------	-------	------	-------	-------	-------	-------	-------	-------	----	-------

(72)

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

(73)m=

309.77	307.45	296.24	278.58	260.87	243.59	232.6	238.25	247.47	265.31	285.73	300.98
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d	Area m ²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)						
North	0.9x	0.77	x	6.37	x	10.63	x	0.63	x	0.7	=	20.7

(74)

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North	0.9x	0.77	x	6.37	x	20.32	x	0.63	x	0.7	=	39.56	(74)
North	0.9x	0.77	x	6.37	x	34.53	x	0.63	x	0.7	=	67.22	(74)
North	0.9x	0.77	x	6.37	x	55.46	x	0.63	x	0.7	=	107.98	(74)
North	0.9x	0.77	x	6.37	x	74.72	x	0.63	x	0.7	=	145.45	(74)
North	0.9x	0.77	x	6.37	x	79.99	x	0.63	x	0.7	=	155.71	(74)
North	0.9x	0.77	x	6.37	x	74.68	x	0.63	x	0.7	=	145.38	(74)
North	0.9x	0.77	x	6.37	x	59.25	x	0.63	x	0.7	=	115.34	(74)
North	0.9x	0.77	x	6.37	x	41.52	x	0.63	x	0.7	=	80.82	(74)
North	0.9x	0.77	x	6.37	x	24.19	x	0.63	x	0.7	=	47.09	(74)
North	0.9x	0.77	x	6.37	x	13.12	x	0.63	x	0.7	=	25.54	(74)
North	0.9x	0.77	x	6.37	x	8.86	x	0.63	x	0.7	=	17.26	(74)
East	0.9x	0.77	x	6.1	x	19.64	x	0.63	x	0.7	=	36.61	(76)
East	0.9x	0.77	x	6.1	x	38.42	x	0.63	x	0.7	=	71.63	(76)
East	0.9x	0.77	x	6.1	x	63.27	x	0.63	x	0.7	=	117.96	(76)
East	0.9x	0.77	x	6.1	x	92.28	x	0.63	x	0.7	=	172.03	(76)
East	0.9x	0.77	x	6.1	x	113.09	x	0.63	x	0.7	=	210.83	(76)
East	0.9x	0.77	x	6.1	x	115.77	x	0.63	x	0.7	=	215.82	(76)
East	0.9x	0.77	x	6.1	x	110.22	x	0.63	x	0.7	=	205.47	(76)
East	0.9x	0.77	x	6.1	x	94.68	x	0.63	x	0.7	=	176.5	(76)
East	0.9x	0.77	x	6.1	x	73.59	x	0.63	x	0.7	=	137.19	(76)
East	0.9x	0.77	x	6.1	x	45.59	x	0.63	x	0.7	=	84.99	(76)
East	0.9x	0.77	x	6.1	x	24.49	x	0.63	x	0.7	=	45.65	(76)
East	0.9x	0.77	x	6.1	x	16.15	x	0.63	x	0.7	=	30.11	(76)

Solar gains in watts, calculated for each month

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

(83)m=	57.31	111.18	185.18	280.01	356.28	371.54	350.85	291.84	218.01	132.08	71.19	47.37	(83)
--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	-------	------

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

(84)m=	367.08	418.63	481.42	558.59	617.15	615.12	583.45	530.08	465.48	397.39	356.92	348.34	(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	0.99	0.96	0.88	0.73	0.58	0.65	0.88	0.98	1	1	(86)

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

(87)m=	19.41	19.57	19.87	20.29	20.67	20.9	20.97	20.96	20.76	20.28	19.78	19.39	(87)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------

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

(88)m=	19.73	19.73	19.73	19.75	19.75	19.76	19.76	19.77	19.76	19.75	19.74	19.74	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	1	0.99	0.98	0.94	0.84	0.63	0.43	0.5	0.81	0.97	0.99	1	(89)
--------	---	------	------	------	------	------	------	-----	------	------	------	---	------

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

(90)m=	17.64	17.87	18.31	18.93	19.43	19.7	19.75	19.75	19.57	18.92	18.19	17.62	(90)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.43 (91)

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

(92)m=	18.4	18.61	18.99	19.51	19.96	20.21	20.28	20.27	20.08	19.51	18.87	18.38	(92)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.4	18.61	18.99	19.51	19.96	20.21	20.28	20.27	20.08	19.51	18.87	18.38	(93)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

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

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

Utilisation factor for gains, hm :

(94)m=	0.99	0.99	0.98	0.94	0.84	0.67	0.5	0.56	0.83	0.96	0.99	1	(94)
--------	------	------	------	------	------	------	-----	------	------	------	------	---	------

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

(95)m=	365.18	414.71	471.06	524.98	521.23	413.41	288.81	297.84	385.18	383.18	353.64	346.9	(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 , $W = [(39)m \times [(93)m - (96)m]$

(97)m=	1177.78	1141.32	1036.78	869.59	674.99	453.35	297	311.64	485.26	728.03	967.14	1170.9	(97)
--------	---------	---------	---------	--------	--------	--------	-----	--------	--------	--------	--------	--------	------

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

(98)m=	604.57	488.28	420.89	248.12	114.4	0	0	0	0	256.57	441.72	613.06	
Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$												3187.61	(98)

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

55.27	(99)
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9a. Energy requirements – Individual heating systems including micro-CHP

Space heating:

Fraction of space heat from secondary/supplementary system

0	(201)
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Fraction of space heat from main system(s)

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

1	(202)
---	-------

Fraction of total heating from main system 1

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

1	(204)
---	-------

Efficiency of main space heating system 1

93.4	(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)

604.57	488.28	420.89	248.12	114.4	0	0	0	0	256.57	441.72	613.06
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

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

647.29	522.79	450.64	265.65	122.48	0	0	0	0	274.7	472.93	656.38
--------	--------	--------	--------	--------	---	---	---	---	-------	--------	--------

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

3412.86	(211)
---------	-------

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

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

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

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

0	(215)
---	-------

Water heating

Output from water heater (calculated above)

174.65	152.56	158.73	140.78	136.3	120.05	115.02	128.22	129.63	147.61	157.57	170.55
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------

Efficiency of water heater

80.3	(216)
------	-------

(217)m=	87.92	87.77	87.39	86.46	84.61	80.3	80.3	80.3	80.3	86.43	87.51	87.99	(217)
---------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------

Fuel for water heating, $kWh/month$

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

(219)m=	198.64	173.81	181.63	162.83	161.09	149.5	143.23	159.67	161.44	170.79	180.07	193.82
---------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------

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

2036.53	(219)
---------	-------

TER WorkSheet: New dwelling design stage

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		3412.86
Water heating fuel used		2036.53
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75 (231)
Electricity for lighting		263.25 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		5787.65 (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	0.216	=	737.18 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.216	=	439.89 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1177.07 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93 (267)
Electricity for lighting	(232) x	0.519	=	136.63 (268)
Total CO2, kg/year		sum of (265)...(271) =		1352.62 (272)
TER =				23.45 (273)

Project name

807 High Street Base

As designed

Date: Mon Aug 17 08:41:35 2020

Administrative information**Building Details**

Address: Retail Units, 807 High Street, London, N17 8ER

Owner Details

Name: c/o P3R Consulting Engineers

Telephone number:

Address: , ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.1

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.0

BRUKL compliance check version: v5.6.a.1

Certifier details

Name: Neil Ingham

Telephone number:

Address: Holborn Tower, 137-144 High Holborn London, WC1V 6PL

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	19.3
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	19.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	14.4
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.16	0.16	Block 1 - Circulation_W_16
Floor	0.25	0.14	0.14	Block 1 - Circulation_S_3
Roof	0.25	0.12	0.12	Block 1 - Circulation_R_4
Windows***, roof windows, and rooflights	2.2	1.4	1.4	Block 1 - Circulation_G_17
Personnel doors	2.2	1.4	1.4	Block 1 - Holding_D_8
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the [Non-Domestic Building Services Compliance Guide](#) for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- Gas Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- Gas Boiler and Cooling

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.94	3.2	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.94	-
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
Block 1 - WC	-	-	0.4	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting

		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
Standard value		60	60	22	
Block 1 - Circulation		-	110	-	62

General lighting and display lighting		Luminous efficacy [lm/W]		
Zone name		Luminaire	Lamp	Display lamp
	Standard value	60	60	22
Block 1 - WC		-	110	-
Block 1 - Store		110	-	-
Block 2 - Circulation		-	110	-
Block 1 - Arrangement Room		110	-	-
Block 1 - Tea Prep		-	110	-
Block 1 - Viewing Room		-	110	80
Block 1 - Reception		-	110	-
Block 1 - Hall		-	110	-
Block 1 - Viewing Room		-	110	80
Block 1 - Holding		110	-	-
Block 2 - D1 Use		-	110	-

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 1 - Arrangement Room	YES (+65.8%)	NO
Block 1 - Tea Prep	N/A	N/A
Block 1 - Viewing Room	N/A	N/A
Block 1 - Reception	YES (+65.4%)	NO
Block 1 - Hall	N/A	N/A
Block 1 - Viewing Room	N/A	N/A
Block 1 - Holding	N/A	N/A
Block 2 - D1 Use	NO (-55.6%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	271	271
External area [m ²]	412.3	412.3
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	113.29	160.25
Average U-value [W/m ² K]	0.27	0.39
Alpha value* [%]	19.7	14.57

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
73	A1/A2 Retail/Financial and Professional services A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways B1 Offices and Workshop businesses B2 to B7 General Industrial and Special Industrial Groups B8 Storage or Distribution C1 Hotels C2 Residential Institutions: Hospitals and Care Homes C2 Residential Institutions: Residential schools C2 Residential Institutions: Universities and colleges C2A Secure Residential Institutions Residential spaces
27	D1 Non-residential Institutions: Community/Day Centre D1 Non-residential Institutions: Libraries, Museums, and Galleries D1 Non-residential Institutions: Education D1 Non-residential Institutions: Primary Health Care Building D1 Non-residential Institutions: Crown and County Courts D2 General Assembly and Leisure, Night Clubs, and Theatres Others: Passenger terminals Others: Emergency services Others: Miscellaneous 24hr activities Others: Car Parks 24 hrs Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	25.74	29.82
Cooling	4.69	6.07
Auxiliary	0.69	0.66
Lighting	11.04	17.85
Hot water	1.8	1.95
Equipment*	11.22	11.22
TOTAL**	43.97	56.36

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	173.1	188.53
Primary energy* [kWh/m ²]	83.53	112.36
Total emissions [kg/m ²]	14.4	19.3

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas									
Actual	72.2	46.4	23.9	0	2.6	0.84	0	0.94	0
Notional	90.2	81	30.6	0	2.5	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	87.7	105.6	26.4	6.4	0	0.92	4.56	0.94	6.1
Notional	87.1	107.8	29.5	8.3	0	0.82	3.6	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.16	Block 1 - Circulation_W_16
Floor	0.2	0.14	Block 1 - Circulation_S_3
Roof	0.15	0.12	Block 1 - Circulation_R_4
Windows, roof windows, and rooflights	1.5	1.4	Block 1 - Circulation_G_17
Personnel doors	1.5	1.4	Block 1 - Holding_D_8
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)] U _{i-Min} = Minimum individual element U-values [W/(m²K)]			
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3