Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
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Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74.4m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 004

Address : AC 004, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	24.73 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	6.66 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

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7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	2.69m²	
Windows facing: South	11.21m²	
Windows facing: West	1.8m²	
Windows facing: West	1.8m²	
Windows facing: West	3.24m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features

Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 004

Address : AC 004, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	74.4	(1a)	x	2.9	(2a)	=	215.76	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74.4	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	215.76	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(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

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

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

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

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

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

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

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.69	x1/[1/(1.4)+ 0.04] =	3.57			(27)
Windows Type 2			11.21	x1/[1/(1.4)+ 0.04] =	14.86			(27)
Windows Type 3			1.8	x1/[1/(1.4)+ 0.04] =	2.39			(27)
Windows Type 4			1.8	x1/[1/(1.4)+ 0.04] =	2.39			(27)
Windows Type 5			3.24	x1/[1/(1.4)+ 0.04] =	4.3			(27)
Floor			74.4	x 0.12 =	8.928			(28)
Walls	49.53	20.74	28.79	x 0.12 =	3.46			(29)
Total area of elements, m²			123.93					(31)
Party wall			49.76	x 0 =	0			(32)

** 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) = 39.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 11.69 (36)

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

Total fabric heat loss (33) + (36) = 51.57 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.08	15.93	15.78	15.02	14.87	14.12	14.12	13.96	14.42	14.87	15.17	15.48	(38)

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

(39)m=	67.65	67.5	67.35	66.59	66.44	65.68	65.68	65.53	65.98	66.44	66.74	67.04	

Average = Sum(39)1…12 /12= 66.55 (39)

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

(40)m=	0.91	0.91	0.91	0.9	0.89	0.88	0.88	0.88	0.89	0.89	0.9	0.9

Average = Sum(40)$_{1…12}$ /12= 0.89 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.35 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 89.97 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m=	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96

Total = Sum(44)$_{1…12}$ = 1079.59 (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=	146.76	128.36	132.45	115.47	110.8	95.61	88.6	101.67	102.88	119.9	130.88	142.13

Total = Sum(45)$_{1…12}$ = 1415.52 (45)

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

(46)m=	22.01	19.25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(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) = — 110 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a — 1.03 (52)

Temperature factor from Table 2b — 0.6 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = — 1.03 (54)

Enter (50) or (54) in (55) — 1.03 (55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

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

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

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

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

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

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

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

(62)m=	202.04	178.28	187.73	168.97	166.08	149.11	143.88	156.95	156.38	175.18	184.37	197.4	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	202.04	178.28	187.73	168.97	166.08	149.11	143.88	156.95	156.38	175.18	184.37	197.4	

Output from water heater (annual)$_{1...12}$ 2066.36 (64)

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

(65)m=	93.02	82.62	88.26	81.19	81.06	74.59	73.68	78.03	77	84.09	86.31	91.48	(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=	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	(66)

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

(67)m=	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19	(67)

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

(68)m=	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.96	158.39	169.93	184.5	198.19	(68)

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

(69)m=	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	(71)

Water heating gains (Table 5)

(72)m=	125.03	122.95	118.63	112.76	108.96	103.59	99.03	104.87	106.95	113.02	119.88	122.96	(72)

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

(73)m=	409.07	407.08	394.27	373.62	352.69	332.46	319.26	325.02	335.58	356.44	380.42	398.37	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
South	0.9x	0.77	x	2.69	x	46.75	x	0.4	x	0.8	=	27.89	(78)
South	0.9x	0.77	x	11.21	x	46.75	x	0.4	x	0.8	=	116.22	(78)
South	0.9x	0.77	x	2.69	x	76.57	x	0.4	x	0.8	=	45.68	(78)
South	0.9x	0.77	x	11.21	x	76.57	x	0.4	x	0.8	=	190.34	(78)
South	0.9x	0.77	x	2.69	x	97.53	x	0.4	x	0.8	=	58.18	(78)

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South	0.9x	0.77	x	11.21	x	97.53	x	0.4	x	0.8	=	242.46	(78)
South	0.9x	0.77	x	2.69	x	110.23	x	0.4	x	0.8	=	65.76	(78)
South	0.9x	0.77	x	11.21	x	110.23	x	0.4	x	0.8	=	274.04	(78)
South	0.9x	0.77	x	2.69	x	114.87	x	0.4	x	0.8	=	68.52	(78)
South	0.9x	0.77	x	11.21	x	114.87	x	0.4	x	0.8	=	285.56	(78)
South	0.9x	0.77	x	2.69	x	110.55	x	0.4	x	0.8	=	65.95	(78)
South	0.9x	0.77	x	11.21	x	110.55	x	0.4	x	0.8	=	274.81	(78)
South	0.9x	0.77	x	2.69	x	108.01	x	0.4	x	0.8	=	64.43	(78)
South	0.9x	0.77	x	11.21	x	108.01	x	0.4	x	0.8	=	268.51	(78)
South	0.9x	0.77	x	2.69	x	104.89	x	0.4	x	0.8	=	62.57	(78)
South	0.9x	0.77	x	11.21	x	104.89	x	0.4	x	0.8	=	260.76	(78)
South	0.9x	0.77	x	2.69	x	101.89	x	0.4	x	0.8	=	60.78	(78)
South	0.9x	0.77	x	11.21	x	101.89	x	0.4	x	0.8	=	253.28	(78)
South	0.9x	0.77	x	2.69	x	82.59	x	0.4	x	0.8	=	49.27	(78)
South	0.9x	0.77	x	11.21	x	82.59	x	0.4	x	0.8	=	205.3	(78)
South	0.9x	0.77	x	2.69	x	55.42	x	0.4	x	0.8	=	33.06	(78)
South	0.9x	0.77	x	11.21	x	55.42	x	0.4	x	0.8	=	137.76	(78)
South	0.9x	0.77	x	2.69	x	40.4	x	0.4	x	0.8	=	24.1	(78)
South	0.9x	0.77	x	11.21	x	40.4	x	0.4	x	0.8	=	100.43	(78)
West	0.9x	0.77	x	1.8	x	19.64	x	0.4	x	0.8	=	7.84	(80)
West	0.9x	0.77	x	1.8	x	19.64	x	0.4	x	0.8	=	7.84	(80)
West	0.9x	0.77	x	3.24	x	19.64	x	0.4	x	0.8	=	14.11	(80)
West	0.9x	0.77	x	1.8	x	38.42	x	0.4	x	0.8	=	15.34	(80)
West	0.9x	0.77	x	1.8	x	38.42	x	0.4	x	0.8	=	15.34	(80)
West	0.9x	0.77	x	3.24	x	38.42	x	0.4	x	0.8	=	27.61	(80)
West	0.9x	0.77	x	1.8	x	63.27	x	0.4	x	0.8	=	25.26	(80)
West	0.9x	0.77	x	1.8	x	63.27	x	0.4	x	0.8	=	25.26	(80)
West	0.9x	0.77	x	3.24	x	63.27	x	0.4	x	0.8	=	45.46	(80)
West	0.9x	0.77	x	1.8	x	92.28	x	0.4	x	0.8	=	36.84	(80)
West	0.9x	0.77	x	1.8	x	92.28	x	0.4	x	0.8	=	36.84	(80)
West	0.9x	0.77	x	3.24	x	92.28	x	0.4	x	0.8	=	66.3	(80)
West	0.9x	0.77	x	1.8	x	113.09	x	0.4	x	0.8	=	45.14	(80)
West	0.9x	0.77	x	1.8	x	113.09	x	0.4	x	0.8	=	45.14	(80)
West	0.9x	0.77	x	3.24	x	113.09	x	0.4	x	0.8	=	81.26	(80)
West	0.9x	0.77	x	1.8	x	115.77	x	0.4	x	0.8	=	46.21	(80)
West	0.9x	0.77	x	1.8	x	115.77	x	0.4	x	0.8	=	46.21	(80)
West	0.9x	0.77	x	3.24	x	115.77	x	0.4	x	0.8	=	83.18	(80)
West	0.9x	0.77	x	1.8	x	110.22	x	0.4	x	0.8	=	44	(80)
West	0.9x	0.77	x	1.8	x	110.22	x	0.4	x	0.8	=	44	(80)
West	0.9x	0.77	x	3.24	x	110.22	x	0.4	x	0.8	=	79.19	(80)
West	0.9x	0.77	x	1.8	x	94.68	x	0.4	x	0.8	=	37.79	(80)

West	0.9x	0.77	x	1.8	x	94.68	x	0.4	x	0.8	=	37.79	(80)
West	0.9x	0.77	x	3.24	x	94.68	x	0.4	x	0.8	=	68.02	(80)
West	0.9x	0.77	x	1.8	x	73.59	x	0.4	x	0.8	=	29.37	(80)
West	0.9x	0.77	x	1.8	x	73.59	x	0.4	x	0.8	=	29.37	(80)
West	0.9x	0.77	x	3.24	x	73.59	x	0.4	x	0.8	=	52.87	(80)
West	0.9x	0.77	x	1.8	x	45.59	x	0.4	x	0.8	=	18.2	(80)
West	0.9x	0.77	x	1.8	x	45.59	x	0.4	x	0.8	=	18.2	(80)
West	0.9x	0.77	x	3.24	x	45.59	x	0.4	x	0.8	=	32.76	(80)
West	0.9x	0.77	x	1.8	x	24.49	x	0.4	x	0.8	=	9.78	(80)
West	0.9x	0.77	x	1.8	x	24.49	x	0.4	x	0.8	=	9.78	(80)
West	0.9x	0.77	x	3.24	x	24.49	x	0.4	x	0.8	=	17.6	(80)
West	0.9x	0.77	x	1.8	x	16.15	x	0.4	x	0.8	=	6.45	(80)
West	0.9x	0.77	x	1.8	x	16.15	x	0.4	x	0.8	=	6.45	(80)
West	0.9x	0.77	x	3.24	x	16.15	x	0.4	x	0.8	=	11.6	(80)

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

(83)m=	173.9	294.3	396.62	479.77	525.63	516.36	500.13	466.94	425.68	323.72	207.97	149.02	(83)

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

(84)m=	582.97	701.37	790.89	853.39	878.32	848.82	819.39	791.96	761.26	680.16	588.39	547.39	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.97	0.93	0.83	0.68	0.49	0.35	0.38	0.59	0.87	0.98	0.99	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)													
(87)m=	20.27	20.47	20.68	20.88	20.97	21	21	21	20.99	20.87	20.53	20.23	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)													
(88)m=	20.16	20.16	20.16	20.17	20.17	20.18	20.18	20.18	20.18	20.17	20.17	20.17	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)													
(89)m=	0.99	0.97	0.92	0.8	0.63	0.43	0.29	0.31	0.52	0.83	0.97	0.99	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m=	19.2	19.48	19.78	20.04	20.15	20.18	20.18	20.18	20.17	20.04	19.58	19.15	(90)

fLA = Living area ÷ (4) = | 0.37 | (91)

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

(92)m=	19.59	19.84	20.11	20.35	20.45	20.48	20.48	20.48	20.47	20.34	19.93	19.54	(92)

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

(93)m=	19.59	19.84	20.11	20.35	20.45	20.48	20.48	20.48	20.47	20.34	19.93	19.54	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.96	0.91	0.81	0.64	0.45	0.31	0.34	0.55	0.84	0.97	0.99	(94)

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

(95)m=	575.11	676.2	723.24	689.22	565.14	384.63	254.85	267.36	415.69	570.3	568.83	542	(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=	1034.54	1008.6	916.85	762.23	581.28	386.18	254.97	267.56	420.44	647.11	856.46	1028.65	(97)

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

(98)m=	341.81	223.38	144.05	52.57	12.01	0	0	0	0	57.15	207.09	362.07

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1400.12 (98)

Space heating requirement in kWh/m²/year 18.82 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1400.12	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1540.14	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		2066.36	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2272.99	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.13	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		164.52	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	164.52	(331)
Energy for lighting (calculated in Appendix L)		326.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-769.49	(333)

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Electricity generated by wind turbine (Appendix M) (negative quantity)			0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	= 620.38	(367)
Electrical energy for heat distribution	[(313) x		0.52	= 19.79	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			= 640.17	(373)
CO2 associated with space heating (secondary)	(309) x		0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			640.17	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	= 85.38	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	= 169.42	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-399.36	(380)
Total CO2, kg/year	sum of (376)…(382) =			495.62	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			6.66	(384)
EI rating (section 14)				94.44	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 004

Address : AC 004, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74.4	(1a) x	2.9	(2a) =	215.76	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	215.76	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.33	(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

0.42	0.41	0.41	0.36	0.36	0.31	0.31	0.31	0.33	0.36	0.37	0.39

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.41	x1/[1/(1.4)+ 0.04] =	3.2			(27)
Windows Type 2			10.05	x1/[1/(1.4)+ 0.04] =	13.32			(27)
Windows Type 3			1.61	x1/[1/(1.4)+ 0.04] =	2.13			(27)
Windows Type 4			1.61	x1/[1/(1.4)+ 0.04] =	2.13			(27)
Windows Type 5			2.91	x1/[1/(1.4)+ 0.04] =	3.86			(27)
Floor			74.4	x 0.13 =	9.672			(28)
Walls	49.53	18.59	30.94	x 0.18 =	5.57			(29)
Total area of elements, m²			123.93					(31)
Party wall			49.76	x 0 =	0			(32)

** 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) = 39.89 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 8.03 (36)

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

Total fabric heat loss (33) + (36) = 47.92 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	41.93	41.68	41.44	40.31	40.1	39.11	39.11	38.93	39.49	40.1	40.53	40.98	(38)

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

(39)m=	89.85	89.61	89.36	88.23	88.02	87.04	87.04	86.85	87.42	88.02	88.45	88.9

Average = Sum(39)$_{1…12}$ /12= 88.23 (39)

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

(40)m=	1.21	1.2	1.2	1.19	1.18	1.17	1.17	1.17	1.17	1.18	1.19	1.19

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 2.35 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.97 (43)

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

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

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

(44)m=	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96

Total = Sum(44)$_{1...12}$ = 1079.59 (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=	146.76	128.36	132.45	115.47	110.8	95.61	88.6	101.67	102.88	119.9	130.88	142.13

Total = Sum(45)$_{1...12}$ = 1415.52 (45)

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

(46)m=	22.01	19.25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

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

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

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

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

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

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

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

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

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

(62)m=	193.35	170.44	179.05	160.57	157.4	140.7	135.19	148.26	147.98	166.5	175.97	188.72	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	193.35	170.44	179.05	160.57	157.4	140.7	135.19	148.26	147.98	166.5	175.97	188.72	

Output from water heater (annual)1…12 | 1964.13 | (64)

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

(65)m=	86.07	76.35	81.32	74.47	74.12	67.86	66.74	71.08	70.28	77.14	79.59	84.53	(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=	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.96	158.39	169.93	184.5	198.19	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	(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=	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	(71)
Water heating gains (Table 5)													
(72)m=	115.69	113.61	109.3	103.43	99.62	94.26	89.7	95.54	97.61	103.69	110.54	113.62	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	402.74	400.74	387.94	367.29	346.35	326.12	312.93	318.68	329.25	350.11	374.08	392.03	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
South	0.9x	0.77	x	2.41	x	46.75	x	0.63	x	0.7	=	34.43	(78)
South	0.9x	0.77	x	10.05	x	46.75	x	0.63	x	0.7	=	143.59	(78)
South	0.9x	0.77	x	2.41	x	76.57	x	0.63	x	0.7	=	56.39	(78)
South	0.9x	0.77	x	10.05	x	76.57	x	0.63	x	0.7	=	235.17	(78)
South	0.9x	0.77	x	2.41	x	97.53	x	0.63	x	0.7	=	71.84	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	10.05	x	97.53	x	0.63	x	0.7	=	299.57	(78)
South	0.9x	0.77	x	2.41	x	110.23	x	0.63	x	0.7	=	81.19	(78)
South	0.9x	0.77	x	10.05	x	110.23	x	0.63	x	0.7	=	338.58	(78)
South	0.9x	0.77	x	2.41	x	114.87	x	0.63	x	0.7	=	84.61	(78)
South	0.9x	0.77	x	10.05	x	114.87	x	0.63	x	0.7	=	352.82	(78)
South	0.9x	0.77	x	2.41	x	110.55	x	0.63	x	0.7	=	81.42	(78)
South	0.9x	0.77	x	10.05	x	110.55	x	0.63	x	0.7	=	339.54	(78)
South	0.9x	0.77	x	2.41	x	108.01	x	0.63	x	0.7	=	79.55	(78)
South	0.9x	0.77	x	10.05	x	108.01	x	0.63	x	0.7	=	331.75	(78)
South	0.9x	0.77	x	2.41	x	104.89	x	0.63	x	0.7	=	77.26	(78)
South	0.9x	0.77	x	10.05	x	104.89	x	0.63	x	0.7	=	322.17	(78)
South	0.9x	0.77	x	2.41	x	101.89	x	0.63	x	0.7	=	75.04	(78)
South	0.9x	0.77	x	10.05	x	101.89	x	0.63	x	0.7	=	312.93	(78)
South	0.9x	0.77	x	2.41	x	82.59	x	0.63	x	0.7	=	60.83	(78)
South	0.9x	0.77	x	10.05	x	82.59	x	0.63	x	0.7	=	253.65	(78)
South	0.9x	0.77	x	2.41	x	55.42	x	0.63	x	0.7	=	40.82	(78)
South	0.9x	0.77	x	10.05	x	55.42	x	0.63	x	0.7	=	170.21	(78)
South	0.9x	0.77	x	2.41	x	40.4	x	0.63	x	0.7	=	29.75	(78)
South	0.9x	0.77	x	10.05	x	40.4	x	0.63	x	0.7	=	124.08	(78)
West	0.9x	0.77	x	1.61	x	19.64	x	0.63	x	0.7	=	9.66	(80)
West	0.9x	0.77	x	1.61	x	19.64	x	0.63	x	0.7	=	9.66	(80)
West	0.9x	0.77	x	2.91	x	19.64	x	0.63	x	0.7	=	17.47	(80)
West	0.9x	0.77	x	1.61	x	38.42	x	0.63	x	0.7	=	18.9	(80)
West	0.9x	0.77	x	1.61	x	38.42	x	0.63	x	0.7	=	18.9	(80)
West	0.9x	0.77	x	2.91	x	38.42	x	0.63	x	0.7	=	34.17	(80)
West	0.9x	0.77	x	1.61	x	63.27	x	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	x	1.61	x	63.27	x	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	x	2.91	x	63.27	x	0.63	x	0.7	=	56.27	(80)
West	0.9x	0.77	x	1.61	x	92.28	x	0.63	x	0.7	=	45.41	(80)
West	0.9x	0.77	x	1.61	x	92.28	x	0.63	x	0.7	=	45.41	(80)
West	0.9x	0.77	x	2.91	x	92.28	x	0.63	x	0.7	=	82.07	(80)
West	0.9x	0.77	x	1.61	x	113.09	x	0.63	x	0.7	=	55.65	(80)
West	0.9x	0.77	x	1.61	x	113.09	x	0.63	x	0.7	=	55.65	(80)
West	0.9x	0.77	x	2.91	x	113.09	x	0.63	x	0.7	=	100.58	(80)
West	0.9x	0.77	x	1.61	x	115.77	x	0.63	x	0.7	=	56.96	(80)
West	0.9x	0.77	x	1.61	x	115.77	x	0.63	x	0.7	=	56.96	(80)
West	0.9x	0.77	x	2.91	x	115.77	x	0.63	x	0.7	=	102.96	(80)
West	0.9x	0.77	x	1.61	x	110.22	x	0.63	x	0.7	=	54.23	(80)
West	0.9x	0.77	x	1.61	x	110.22	x	0.63	x	0.7	=	54.23	(80)
West	0.9x	0.77	x	2.91	x	110.22	x	0.63	x	0.7	=	98.02	(80)
West	0.9x	0.77	x	1.61	x	94.68	x	0.63	x	0.7	=	46.58	(80)

West	0.9x	0.77	x	1.61	x	94.68	x	0.63	x	0.7	=	46.58	(80)
West	0.9x	0.77	x	2.91	x	94.68	x	0.63	x	0.7	=	84.2	(80)
West	0.9x	0.77	x	1.61	x	73.59	x	0.63	x	0.7	=	36.21	(80)
West	0.9x	0.77	x	1.61	x	73.59	x	0.63	x	0.7	=	36.21	(80)
West	0.9x	0.77	x	2.91	x	73.59	x	0.63	x	0.7	=	65.45	(80)
West	0.9x	0.77	x	1.61	x	45.59	x	0.63	x	0.7	=	22.43	(80)
West	0.9x	0.77	x	1.61	x	45.59	x	0.63	x	0.7	=	22.43	(80)
West	0.9x	0.77	x	2.91	x	45.59	x	0.63	x	0.7	=	40.54	(80)
West	0.9x	0.77	x	1.61	x	24.49	x	0.63	x	0.7	=	12.05	(80)
West	0.9x	0.77	x	1.61	x	24.49	x	0.63	x	0.7	=	12.05	(80)
West	0.9x	0.77	x	2.91	x	24.49	x	0.63	x	0.7	=	21.78	(80)
West	0.9x	0.77	x	1.61	x	16.15	x	0.63	x	0.7	=	7.95	(80)
West	0.9x	0.77	x	1.61	x	16.15	x	0.63	x	0.7	=	7.95	(80)
West	0.9x	0.77	x	2.91	x	16.15	x	0.63	x	0.7	=	14.36	(80)

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

(83)m=	214.82	363.54	489.94	592.64	649.29	637.84	617.79	576.8	525.84	399.89	256.9	184.09	(83)

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

(84)m=	617.56	764.29	877.88	959.93	995.65	963.97	930.71	895.48	855.08	749.99	630.99	576.12	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.95	0.87	0.74	0.56	0.41	0.44	0.66	0.9	0.98	0.99	(86)

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

(87)m=	19.89	20.13	20.42	20.71	20.9	20.98	21	20.99	20.95	20.7	20.23	19.85	(87)

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

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

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

(89)m=	0.99	0.97	0.93	0.84	0.68	0.48	0.31	0.34	0.58	0.87	0.97	0.99	(89)

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

(90)m=	18.46	18.81	19.22	19.62	19.84	19.93	19.94	19.94	19.91	19.62	18.97	18.41	(90)

fLA = Living area ÷ (4) = 0.37 (91)

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

(92)m=	18.99	19.3	19.66	20.02	20.23	20.32	20.33	20.33	20.29	20.02	19.44	18.94	(92)

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

(93)m=	18.99	19.3	19.66	20.02	20.23	20.32	20.33	20.33	20.29	20.02	19.44	18.94	(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

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.99	0.97	0.93	0.84	0.7	0.51	0.35	0.38	0.61	0.87	0.97	0.99	(94)

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

(95)m=	609.09	738.39	812.16	805.89	694.01	488.29	323.47	339.56	519.11	652.13	612	570.19	(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=	1319.74	1289.95	1175.85	981.05	750.88	497.54	324.61	341.32	541.33	828.72	1091.18	1310.05	(97)

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

(98)m=	528.72	370.64	270.59	126.12	42.32	0	0	0	0	131.39	345.01	550.46	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2365.25 (98)

Space heating requirement in kWh/m²/year 31.79 (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 93.5 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	528.72	370.64	270.59	126.12	42.32	0	0	0	0	131.39	345.01	550.46	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	565.48	396.41	289.4	134.89	45.26	0	0	0	0	140.52	368.99	588.72	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2529.68 (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)

	193.35	170.44	179.05	160.57	157.4	140.7	135.19	148.26	147.98	166.5	175.97	188.72

Efficiency of water heater 79.8 (216)

(217)m=	87.36	86.83	85.91	84.18	81.85	79.8	79.8	79.8	79.8	84.19	86.58	87.5	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	221.32	196.29	208.41	190.75	192.3	176.32	169.42	185.79	185.43	197.76	203.25	215.67

Total = Sum(219a)$_{1...12}$ = 2342.71 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2529.68
Water heating fuel used		2342.71
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		326.44	(232)

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	=	546.41	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	506.02	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1052.43	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	169.42	(268)
Total CO2, kg/year		sum of (265)…(271) =		1260.78	(272)

TER = 24.73 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:38:28

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.2m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 005

Address : AC 005, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	30.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	9.37 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: East	4.91m²	
Windows facing: West	7.06m²	
Windows facing: West	1.8m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features

Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 005

Address : AC 005, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.2	(1a) x	2.9	(2a) =	151.38	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.2	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	151.38	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

				Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

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

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

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

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

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

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

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

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

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

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

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.95	x	1.4	=	4.13			(26)
Windows Type 1			4.91	x1/[1/(1.4)+ 0.04]		=	6.51			(27)
Windows Type 2			7.06	x1/[1/(1.4)+ 0.04]		=	9.36			(27)
Windows Type 3			1.8	x1/[1/(1.4)+ 0.04]		=	2.39			(27)
Floor			52.2	x	0.12	=	6.264			(28)
Walls	34.57	16.72	17.85	x	0.12	=	2.14			(29)
Total area of elements, m²			86.77							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 30.79 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 9.46 (36)

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

Total fabric heat loss (33) + (36) = 40.25 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	11.28	11.18	11.07	10.54	10.43	9.9	9.9	9.8	10.12	10.43	10.65	10.86	(38)

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

(39)m=	51.53	51.43	51.32	50.79	50.68	50.15	50.15	50.05	50.36	50.68	50.89	51.11	

Average = Sum(39)$_{1…12}$ /12= 50.76 (39)

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

(40)m=	0.99	0.99	0.98	0.97	0.97	0.96	0.96	0.96	0.96	0.97	0.97	0.98

Average = Sum(40)$_{1…12}$ /12= 0.97 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.75 (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 75.88 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m=	83.47	80.43	77.4	74.36	71.33	68.29	68.29	71.33	74.36	77.4	80.43	83.47

Total = Sum(44)$_{1…12}$ = 910.57 (44)

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

(45)m=	123.78	108.26	111.71	97.4	93.45	80.64	74.73	85.75	86.78	101.13	110.39	119.88

Total = Sum(45)$_{1…12}$ = 1193.9 (45)

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

(46)m=	18.57	16.24	16.76	14.61	14.02	12.1	11.21	12.86	13.02	15.17	16.56	17.98	(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) = 110 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

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

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

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

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

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

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

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

(62)m=	179.06	158.19	166.99	150.89	148.73	134.14	130	141.03	140.27	156.41	163.88	175.15	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	179.06	158.19	166.99	150.89	148.73	134.14	130	141.03	140.27	156.41	163.88	175.15	

Output from water heater (annual)$_{1...12}$ 1844.74 (64)

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

(65)m=	85.38	75.94	81.37	75.18	75.29	69.61	69.07	72.73	71.65	77.85	79.5	84.08	(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=	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	(66)

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

(67)m=	13.64	12.11	9.85	7.46	5.57	4.71	5.08	6.61	8.87	11.26	13.15	14.01	(67)

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

(68)m=	152.94	154.53	150.53	142.02	131.27	121.17	114.42	112.83	116.83	125.35	136.09	146.2	(68)

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

(69)m=	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	(71)

Water heating gains (Table 5)

(72)m=	114.76	113	109.36	104.42	101.2	96.68	92.83	97.76	99.51	104.63	110.42	113.01	(72)

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

(73)m=	330.66	328.97	319.07	303.21	287.37	271.88	261.66	266.53	274.54	290.57	308.98	322.55	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	4.91	x	19.64	x	0.4	x	0.8	=	21.39	(76)
East	0.9x	0.77	x	4.91	x	38.42	x	0.4	x	0.8	=	41.83	(76)
East	0.9x	0.77	x	4.91	x	63.27	x	0.4	x	0.8	=	68.89	(76)
East	0.9x	0.77	x	4.91	x	92.28	x	0.4	x	0.8	=	100.48	(76)
East	0.9x	0.77	x	4.91	x	113.09	x	0.4	x	0.8	=	123.14	(76)

East	0.9x	0.77	x	4.91	x	115.77	x	0.4	x	0.8	=	126.06	(76)
East	0.9x	0.77	x	4.91	x	110.22	x	0.4	x	0.8	=	120.01	(76)
East	0.9x	0.77	x	4.91	x	94.68	x	0.4	x	0.8	=	103.09	(76)
East	0.9x	0.77	x	4.91	x	73.59	x	0.4	x	0.8	=	80.13	(76)
East	0.9x	0.77	x	4.91	x	45.59	x	0.4	x	0.8	=	49.64	(76)
East	0.9x	0.77	x	4.91	x	24.49	x	0.4	x	0.8	=	26.66	(76)
East	0.9x	0.77	x	4.91	x	16.15	x	0.4	x	0.8	=	17.59	(76)
West	0.9x	0.77	x	7.06	x	19.64	x	0.4	x	0.8	=	30.75	(80)
West	0.9x	0.77	x	1.8	x	19.64	x	0.4	x	0.8	=	7.84	(80)
West	0.9x	0.77	x	7.06	x	38.42	x	0.4	x	0.8	=	60.15	(80)
West	0.9x	0.77	x	1.8	x	38.42	x	0.4	x	0.8	=	15.34	(80)
West	0.9x	0.77	x	7.06	x	63.27	x	0.4	x	0.8	=	99.06	(80)
West	0.9x	0.77	x	1.8	x	63.27	x	0.4	x	0.8	=	25.26	(80)
West	0.9x	0.77	x	7.06	x	92.28	x	0.4	x	0.8	=	144.48	(80)
West	0.9x	0.77	x	1.8	x	92.28	x	0.4	x	0.8	=	36.84	(80)
West	0.9x	0.77	x	7.06	x	113.09	x	0.4	x	0.8	=	177.06	(80)
West	0.9x	0.77	x	1.8	x	113.09	x	0.4	x	0.8	=	45.14	(80)
West	0.9x	0.77	x	7.06	x	115.77	x	0.4	x	0.8	=	181.25	(80)
West	0.9x	0.77	x	1.8	x	115.77	x	0.4	x	0.8	=	46.21	(80)
West	0.9x	0.77	x	7.06	x	110.22	x	0.4	x	0.8	=	172.56	(80)
West	0.9x	0.77	x	1.8	x	110.22	x	0.4	x	0.8	=	44	(80)
West	0.9x	0.77	x	7.06	x	94.68	x	0.4	x	0.8	=	148.23	(80)
West	0.9x	0.77	x	1.8	x	94.68	x	0.4	x	0.8	=	37.79	(80)
West	0.9x	0.77	x	7.06	x	73.59	x	0.4	x	0.8	=	115.21	(80)
West	0.9x	0.77	x	1.8	x	73.59	x	0.4	x	0.8	=	29.37	(80)
West	0.9x	0.77	x	7.06	x	45.59	x	0.4	x	0.8	=	71.38	(80)
West	0.9x	0.77	x	1.8	x	45.59	x	0.4	x	0.8	=	18.2	(80)
West	0.9x	0.77	x	7.06	x	24.49	x	0.4	x	0.8	=	38.34	(80)
West	0.9x	0.77	x	1.8	x	24.49	x	0.4	x	0.8	=	9.78	(80)
West	0.9x	0.77	x	7.06	x	16.15	x	0.4	x	0.8	=	25.29	(80)
West	0.9x	0.77	x	1.8	x	16.15	x	0.4	x	0.8	=	6.45	(80)

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

(83)m=	59.97	117.32	193.21	281.79	345.34	353.52	336.57	289.11	224.71	139.21	74.78	49.32	(83)

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

(84)m=	390.63	446.29	512.28	585	632.72	625.4	598.23	555.63	499.25	429.78	383.76	371.87	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.96	0.87	0.7	0.51	0.37	0.41	0.67	0.92	0.99	1	(86)

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

(87)m=	20.12	20.28	20.53	20.81	20.95	20.99	21	21	20.97	20.76	20.39	20.09	(87)

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

(88)m=	20.09	20.1	20.1	20.11	20.11	20.12	20.12	20.12	20.11	20.11	20.1	20.1	(88)

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

(89)m=	0.99	0.98	0.95	0.84	0.65	0.44	0.29	0.33	0.59	0.9	0.98	0.99	(89)

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

(90)m=	18.94	19.16	19.52	19.89	20.07	20.11	20.12	20.12	20.09	19.84	19.33	18.9	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.49	19.69	20	20.32	20.48	20.53	20.53	20.53	20.51	20.27	19.83	19.46	(92)

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

(93)m=	19.49	19.69	20	20.32	20.48	20.53	20.53	20.53	20.51	20.27	19.83	19.46	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.95	0.85	0.67	0.47	0.33	0.37	0.63	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	386.85	437.2	484.8	496.34	425.98	295.14	196.91	206.32	313.1	387.72	375.81	369.05	(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=	782.96	760.47	692.56	580.12	445.1	297.21	197.12	206.73	322.68	490.27	647.67	779.77	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	294.7	217.24	154.57	60.32	14.23	0	0	0	0	76.29	195.74	305.58	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1318.67 (98)

Space heating requirement in kWh/m²/year 25.26 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1318.67	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1450.53	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308

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Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement		1844.74	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2029.21	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	34.8	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		115.43	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	115.43	(331)
Energy for lighting (calculated in Appendix L)		240.8	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-539.76	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	566.14	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.06	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	584.2	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				584.2	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	59.91	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	124.98	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-280.14	(380)
Total CO2, kg/year	sum of (376)…(382) =				488.95	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				9.37	(384)
EI rating (section 14)					93.26	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 005

Address : AC 005, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	52.2	(1a)	x	2.9	(2a)	=	151.38	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.2	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	151.38	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.32	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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

0.41	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.37	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

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

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.95	x	1.2	=	3.54			(26)
Windows Type 1			3.6	x1/[1/(1.4)+ 0.04]		=	4.77			(27)
Windows Type 2			5.18	x1/[1/(1.4)+ 0.04]		=	6.87			(27)
Windows Type 3			1.32	x1/[1/(1.4)+ 0.04]		=	1.75			(27)
Floor			52.2	x	0.13	=	6.786			(28)
Walls	34.57	13.05	21.52	x	0.18	=	3.87			(29)
Total area of elements, m²			86.77							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 27.59 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.41 (36)

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

Total fabric heat loss (33) + (36) = 34 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.26	29.09	28.93	28.17	28.02	27.36	27.36	27.23	27.61	28.02	28.31	28.62	(38)

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

(39)m=	63.27	63.1	62.94	62.17	62.03	61.36	61.36	61.24	61.62	62.03	62.32	62.62	

Average = Sum(39)$_{1…12}$ /12= 62.17 (39)

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

(40)m=	1.21	1.21	1.21	1.19	1.19	1.18	1.18	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 1.75 (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 75.88 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	83.47	80.43	77.4	74.36	71.33	68.29	68.29	71.33	74.36	77.4	80.43	83.47

Total = Sum(44)$_{1...12}$ = 910.57 (44)

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

(45)m=	123.78	108.26	111.71	97.4	93.45	80.64	74.73	85.75	86.78	101.13	110.39	119.88

Total = Sum(45)$_{1...12}$ = 1193.9 (45)

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

(46)m=	18.57	16.24	16.76	14.61	14.02	12.1	11.21	12.86	13.02	15.17	16.56	17.98	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

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

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

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

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

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

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

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

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

(62)m=	170.38	150.35	158.31	142.49	140.05	125.74	121.32	132.35	131.87	147.72	155.48	166.47	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	170.38	150.35	158.31	142.49	140.05	125.74	121.32	132.35	131.87	147.72	155.48	166.47

Output from water heater (annual)$_{1...12}$ 1742.51 (64)

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

(65)m=	78.43	69.67	74.42	68.46	68.35	62.89	62.12	65.79	64.93	70.9	72.78	77.13	(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=	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	87.75	(66)

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

(67)m=	13.64	12.11	9.85	7.46	5.57	4.71	5.08	6.61	8.87	11.26	13.15	14.01	(67)

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

(68)m=	152.94	154.53	150.53	142.02	131.27	121.17	114.42	112.83	116.83	125.35	136.09	146.2	(68)

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

(69)m=	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	31.77	(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=	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	-70.2	(71)

Water heating gains (Table 5)

(72)m=	105.42	103.67	100.03	95.08	91.87	87.34	83.5	88.43	90.18	95.3	101.08	103.68	(72)

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

(73)m=	324.33	322.64	312.73	296.88	281.04	265.54	255.33	260.19	268.2	284.23	302.65	316.21	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	3.6	x	19.64	x	0.63	x	0.7	=	21.61	(76)
East	0.9x	0.77	x	3.6	x	38.42	x	0.63	x	0.7	=	42.27	(76)
East	0.9x	0.77	x	3.6	x	63.27	x	0.63	x	0.7	=	69.61	(76)
East	0.9x	0.77	x	3.6	x	92.28	x	0.63	x	0.7	=	101.53	(76)
East	0.9x	0.77	x	3.6	x	113.09	x	0.63	x	0.7	=	124.43	(76)

East	0.9x	0.77	x	3.6	x	115.77	x	0.63	x	0.7	=	127.37	(76)
East	0.9x	0.77	x	3.6	x	110.22	x	0.63	x	0.7	=	121.26	(76)
East	0.9x	0.77	x	3.6	x	94.68	x	0.63	x	0.7	=	104.16	(76)
East	0.9x	0.77	x	3.6	x	73.59	x	0.63	x	0.7	=	80.96	(76)
East	0.9x	0.77	x	3.6	x	45.59	x	0.63	x	0.7	=	50.16	(76)
East	0.9x	0.77	x	3.6	x	24.49	x	0.63	x	0.7	=	26.94	(76)
East	0.9x	0.77	x	3.6	x	16.15	x	0.63	x	0.7	=	17.77	(76)
West	0.9x	0.77	x	5.18	x	19.64	x	0.63	x	0.7	=	31.09	(80)
West	0.9x	0.77	x	1.32	x	19.64	x	0.63	x	0.7	=	7.92	(80)
West	0.9x	0.77	x	5.18	x	38.42	x	0.63	x	0.7	=	60.82	(80)
West	0.9x	0.77	x	1.32	x	38.42	x	0.63	x	0.7	=	15.5	(80)
West	0.9x	0.77	x	5.18	x	63.27	x	0.63	x	0.7	=	100.17	(80)
West	0.9x	0.77	x	1.32	x	63.27	x	0.63	x	0.7	=	25.52	(80)
West	0.9x	0.77	x	5.18	x	92.28	x	0.63	x	0.7	=	146.09	(80)
West	0.9x	0.77	x	1.32	x	92.28	x	0.63	x	0.7	=	37.23	(80)
West	0.9x	0.77	x	5.18	x	113.09	x	0.63	x	0.7	=	179.03	(80)
West	0.9x	0.77	x	1.32	x	113.09	x	0.63	x	0.7	=	45.62	(80)
West	0.9x	0.77	x	5.18	x	115.77	x	0.63	x	0.7	=	183.27	(80)
West	0.9x	0.77	x	1.32	x	115.77	x	0.63	x	0.7	=	46.7	(80)
West	0.9x	0.77	x	5.18	x	110.22	x	0.63	x	0.7	=	174.48	(80)
West	0.9x	0.77	x	1.32	x	110.22	x	0.63	x	0.7	=	44.46	(80)
West	0.9x	0.77	x	5.18	x	94.68	x	0.63	x	0.7	=	149.88	(80)
West	0.9x	0.77	x	1.32	x	94.68	x	0.63	x	0.7	=	38.19	(80)
West	0.9x	0.77	x	5.18	x	73.59	x	0.63	x	0.7	=	116.5	(80)
West	0.9x	0.77	x	1.32	x	73.59	x	0.63	x	0.7	=	29.69	(80)
West	0.9x	0.77	x	5.18	x	45.59	x	0.63	x	0.7	=	72.17	(80)
West	0.9x	0.77	x	1.32	x	45.59	x	0.63	x	0.7	=	18.39	(80)
West	0.9x	0.77	x	5.18	x	24.49	x	0.63	x	0.7	=	38.77	(80)
West	0.9x	0.77	x	1.32	x	24.49	x	0.63	x	0.7	=	9.88	(80)
West	0.9x	0.77	x	5.18	x	16.15	x	0.63	x	0.7	=	25.57	(80)
West	0.9x	0.77	x	1.32	x	16.15	x	0.63	x	0.7	=	6.52	(80)

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

(83)m=	60.62	118.59	195.3	284.84	349.08	357.35	340.21	292.24	227.15	140.72	75.59	49.85	(83)

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

(84)m=	384.95	441.23	508.04	581.72	630.12	622.89	595.54	552.43	495.35	424.95	378.24	366.06	(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	0.97	0.92	0.79	0.6	0.45	0.5	0.76	0.95	0.99	1	(86)

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

(87)m=	19.8	19.97	20.26	20.61	20.86	20.97	20.99	20.99	20.91	20.57	20.12	19.77	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(88)m=	19.91	19.91	19.92	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.92	19.92		(88)

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

(89)m=	0.99	0.99	0.96	0.89	0.73	0.52	0.34	0.39	0.68	0.93	0.99	0.99		(89)

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

(90)m=	18.33	18.58	18.99	19.49	19.8	19.92	19.94	19.94	19.87	19.45	18.81	18.3		(90)
										fLA = Living area ÷ (4) =			0.47	(91)

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

(92)m=	19.02	19.23	19.58	20.01	20.3	20.41	20.43	20.43	20.36	19.98	19.43	18.99		(92)

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

(93)m=	19.02	19.23	19.58	20.01	20.3	20.41	20.43	20.43	20.36	19.98	19.43	18.99		(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:														
(94)m=	0.99	0.98	0.96	0.89	0.75	0.56	0.39	0.44	0.71	0.93	0.98	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	381.74	434.06	488.06	519.46	475.51	346.7	233.79	244.36	353.55	395.72	372.08	363.62		(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=	931.44	904.27	823.46	691.02	533.37	356.79	235.25	246.92	385.84	581.53	768.14	926.29		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	408.98	315.98	249.54	123.52	43.05	0	0	0	0	138.24	285.16	418.63		
									Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ =				1983.1	(98)
Space heating requirement in kWh/m²/year													37.99	(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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	408.98	315.98	249.54	123.52	43.05	0	0	0	0	138.24	285.16	418.63		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	437.41	337.95	266.89	132.11	46.04	0	0	0	0	147.85	304.98	447.73		
									Total (kWh/year) =$Sum(211)_{1...5,10...12}$=				2120.96	(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)

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Water heating

Output from water heater (calculated above)

170.38	150.35	158.31	142.49	140.05	125.74	121.32	132.35	131.87	147.72	155.48	166.47

Efficiency of water heater 79.8 (216)

(217)m=	87.07	86.75	86.02	84.44	82.08	79.8	79.8	79.8	79.8	84.64	86.41	87.17	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	195.68	173.31	184.03	168.75	170.62	157.56	152.03	165.85	165.25	174.54	179.93	190.96

Total = Sum(219a)$_{1...12}$ = 2078.52 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2120.96	
Water heating fuel used		2078.52	
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		240.8	(232)

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	=	458.13	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	448.96	(264)
Space and water heating	(261) + (262) + (263) + (264) =			907.09	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	124.98	(268)
Total CO2, kg/year		sum of (265)…(271) =		1070.99	(272)

TER = 30.07 (273)

Regulations Compliance Report

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Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 54.8m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 006

Address : AC 006, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	29.58 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	9.00 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

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

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: East	4.91m²	
Windows facing: West	7.06m²	
Windows facing: West	1.8m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features	
Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 006

Address : AC 006, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	54.8	(1a) x	2.9	(2a) =	158.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	54.8	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	158.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

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

Monthly average wind speed from Table 7

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

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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

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

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

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

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

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

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

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.77	x	1.4	=	3.878			(26)
Windows Type 1			4.91	x1/[1/(1.4)+ 0.04]		=	6.51			(27)
Windows Type 2			7.06	x1/[1/(1.4)+ 0.04]		=	9.36			(27)
Windows Type 3			1.8	x1/[1/(1.4)+ 0.04]		=	2.39			(27)
Floor			54.8	x	0.12	=	6.576			(28)
Walls	36.37	16.54	19.83	x	0.12	=	2.38			(29)
Total area of elements, m²			91.17							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 31.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 9.58 (36)

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

Total fabric heat loss (33) + (36) = 40.67 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	11.85	11.73	11.62	11.07	10.95	10.4	10.4	10.29	10.62	10.95	11.18	11.4	(38)

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

(39)m=	52.52	52.4	52.29	51.74	51.62	51.07	51.07	50.96	51.29	51.62	51.85	52.07	

Average = Sum(39)$_{1…12}$ /12= 51.71 (39)

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

(40)m=	0.96	0.96	0.95	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.95	0.95

Average = Sum(40)$_{1…12}$ /12= 0.94 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.83 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 77.7 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	85.47	82.36	79.25	76.14	73.04	69.93	69.93	73.04	76.14	79.25	82.36	85.47	
										Total = Sum(44)$_{1…12}$ =		932.38	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)													
(45)m=	126.75	110.85	114.39	99.73	95.69	82.57	76.52	87.81	88.85	103.55	113.03	122.75	
										Total = Sum(45)$_{1…12}$ =		1222.49	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	19.01	16.63	17.16	14.96	14.35	12.39	11.48	13.17	13.33	15.53	16.96	18.41	(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) = 110 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

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

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

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

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

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

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

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

(62)m=	182.02	160.78	169.67	153.22	150.97	136.07	131.79	143.08	142.35	158.83	166.53	178.02	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	182.02	160.78	169.67	153.22	150.97	136.07	131.79	143.08	142.35	158.83	166.53	178.02	

Output from water heater (annual)$_{1...12}$ 1873.33 (64)

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

(65)m=	86.36	76.8	82.26	75.95	76.04	70.25	69.66	73.42	72.34	78.65	80.38	85.03	(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=	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	14.23	12.64	10.28	7.78	5.82	4.91	5.31	6.9	9.26	11.76	13.72	14.63	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	159.67	161.33	157.15	148.26	137.04	126.5	119.45	117.8	121.97	130.86	142.08	152.62	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	(69)
Pumps and fans gains (Table 5a)													
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	(71)
Water heating gains (Table 5)													
(72)m=	116.08	114.29	110.56	105.49	102.2	97.57	93.63	98.68	100.47	105.72	111.64	114.29	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	340.46	338.73	328.47	312.01	295.54	279.45	268.87	273.85	282.17	298.81	317.91	332.02	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	4.91	x	19.64	x	0.4	x	0.8	=	21.39	(76)
East	0.9x	0.77	x	4.91	x	38.42	x	0.4	x	0.8	=	41.83	(76)
East	0.9x	0.77	x	4.91	x	63.27	x	0.4	x	0.8	=	68.89	(76)
East	0.9x	0.77	x	4.91	x	92.28	x	0.4	x	0.8	=	100.48	(76)
East	0.9x	0.77	x	4.91	x	113.09	x	0.4	x	0.8	=	123.14	(76)

East	0.9x	0.77	x	4.91	x	115.77	x	0.4	x	0.8	=	126.06	(76)
East	0.9x	0.77	x	4.91	x	110.22	x	0.4	x	0.8	=	120.01	(76)
East	0.9x	0.77	x	4.91	x	94.68	x	0.4	x	0.8	=	103.09	(76)
East	0.9x	0.77	x	4.91	x	73.59	x	0.4	x	0.8	=	80.13	(76)
East	0.9x	0.77	x	4.91	x	45.59	x	0.4	x	0.8	=	49.64	(76)
East	0.9x	0.77	x	4.91	x	24.49	x	0.4	x	0.8	=	26.66	(76)
East	0.9x	0.77	x	4.91	x	16.15	x	0.4	x	0.8	=	17.59	(76)
West	0.9x	0.77	x	7.06	x	19.64	x	0.4	x	0.8	=	30.75	(80)
West	0.9x	0.77	x	1.8	x	19.64	x	0.4	x	0.8	=	7.84	(80)
West	0.9x	0.77	x	7.06	x	38.42	x	0.4	x	0.8	=	60.15	(80)
West	0.9x	0.77	x	1.8	x	38.42	x	0.4	x	0.8	=	15.34	(80)
West	0.9x	0.77	x	7.06	x	63.27	x	0.4	x	0.8	=	99.06	(80)
West	0.9x	0.77	x	1.8	x	63.27	x	0.4	x	0.8	=	25.26	(80)
West	0.9x	0.77	x	7.06	x	92.28	x	0.4	x	0.8	=	144.48	(80)
West	0.9x	0.77	x	1.8	x	92.28	x	0.4	x	0.8	=	36.84	(80)
West	0.9x	0.77	x	7.06	x	113.09	x	0.4	x	0.8	=	177.06	(80)
West	0.9x	0.77	x	1.8	x	113.09	x	0.4	x	0.8	=	45.14	(80)
West	0.9x	0.77	x	7.06	x	115.77	x	0.4	x	0.8	=	181.25	(80)
West	0.9x	0.77	x	1.8	x	115.77	x	0.4	x	0.8	=	46.21	(80)
West	0.9x	0.77	x	7.06	x	110.22	x	0.4	x	0.8	=	172.56	(80)
West	0.9x	0.77	x	1.8	x	110.22	x	0.4	x	0.8	=	44	(80)
West	0.9x	0.77	x	7.06	x	94.68	x	0.4	x	0.8	=	148.23	(80)
West	0.9x	0.77	x	1.8	x	94.68	x	0.4	x	0.8	=	37.79	(80)
West	0.9x	0.77	x	7.06	x	73.59	x	0.4	x	0.8	=	115.21	(80)
West	0.9x	0.77	x	1.8	x	73.59	x	0.4	x	0.8	=	29.37	(80)
West	0.9x	0.77	x	7.06	x	45.59	x	0.4	x	0.8	=	71.38	(80)
West	0.9x	0.77	x	1.8	x	45.59	x	0.4	x	0.8	=	18.2	(80)
West	0.9x	0.77	x	7.06	x	24.49	x	0.4	x	0.8	=	38.34	(80)
West	0.9x	0.77	x	1.8	x	24.49	x	0.4	x	0.8	=	9.78	(80)
West	0.9x	0.77	x	7.06	x	16.15	x	0.4	x	0.8	=	25.29	(80)
West	0.9x	0.77	x	1.8	x	16.15	x	0.4	x	0.8	=	6.45	(80)

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

(83)m=	59.97	117.32	193.21	281.79	345.34	353.52	336.57	289.11	224.71	139.21	74.78	49.32	(83)

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

(84)m=	400.43	456.05	521.68	593.8	640.88	632.97	605.43	562.95	506.89	438.02	392.69	381.34	(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=	0.99	0.99	0.96	0.88	0.71	0.51	0.37	0.42	0.67	0.93	0.99	1	(86)

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

(87)m=	20.15	20.3	20.54	20.81	20.96	20.99	21	21	20.98	20.77	20.41	20.12	(87)

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

(88)m=	20.12	20.12	20.12	20.13	20.13	20.14	20.14	20.14	20.14	20.13	20.13	20.13	(88)

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

(89)m=	0.99	0.98	0.95	0.85	0.66	0.44	0.3	0.34	0.6	0.9	0.98	0.99	(89)

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

(90)m=	18.99	19.21	19.56	19.92	20.09	20.14	20.14	20.14	20.12	19.88	19.37	18.95	(90)

fLA = Living area ÷ (4) = 0.48 (91)

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

(92)m=	19.55	19.73	20.03	20.35	20.51	20.55	20.55	20.55	20.53	20.3	19.87	19.51	(92)

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

(93)m=	19.55	19.73	20.03	20.35	20.51	20.55	20.55	20.55	20.53	20.3	19.87	19.51	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.95	0.85	0.68	0.48	0.33	0.38	0.63	0.91	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	396.88	447.46	495.4	507.19	435.5	301.79	201.65	211.24	320.39	396.89	385.13	378.71	(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=	800.72	777.38	707.62	592.4	454.62	303.78	201.84	211.62	329.81	500.95	662.06	797.33	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	300.46	221.7	157.89	61.35	14.22	0	0	0	0	77.43	199.39	311.45	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1343.89 (98)

Space heating requirement in kWh/m²/year 24.52 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1343.89	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1478.28	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308

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Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement		1873.33	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2060.67	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	35.39	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		121.18	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	121.18	(331)
Energy for lighting (calculated in Appendix L)		251.39	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-566.53	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	575.77	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.37	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	594.14	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				594.14	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	62.89	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	130.47	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-294.03	(380)
Total CO2, kg/year	sum of (376)…(382) =				493.47	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				9	(384)
EI rating (section 14)					93.37	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 006

Address : AC 006, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	54.8	(1a) x	2.9	(2a) =	158.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	54.8	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		158.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.32	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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

0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

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

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	(24d)

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

(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.77	x	1.2	=	3.324			(26)
Windows Type 1			3.9	x1/[1/(1.4)+ 0.04]		=	5.17			(27)
Windows Type 2			5.6	x1/[1/(1.4)+ 0.04]		=	7.42			(27)
Windows Type 3			1.43	x1/[1/(1.4)+ 0.04]		=	1.9			(27)
Floor			54.8	x	0.13	=	7.124			(28)
Walls	36.37	13.7	22.67	x	0.18	=	4.08			(29)
Total area of elements, m²			91.17							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 29.02 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.55 (36)

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

Total fabric heat loss (33) + (36) = 35.57 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	30.57	30.4	30.24	29.46	29.31	28.64	28.64	28.51	28.9	29.31	29.61	29.92	(38)

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

(39)m=	66.15	65.98	65.81	65.03	64.89	64.21	64.21	64.08	64.47	64.89	65.18	65.49	

Average = $Sum(39)_{1…12}$ /12= 65.03 (39)

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

(40)m=	1.21	1.2	1.2	1.19	1.18	1.17	1.17	1.17	1.18	1.18	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 1.83 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 77.7 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	85.47	82.36	79.25	76.14	73.04	69.93	69.93	73.04	76.14	79.25	82.36	85.47

Total = Sum(44)1…12 = 932.38 (44)

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

(45)m=	126.75	110.85	114.39	99.73	95.69	82.57	76.52	87.81	88.85	103.55	113.03	122.75

Total = Sum(45)1…12 = 1222.49 (45)

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

(46)m=	19.01	16.63	17.16	14.96	14.35	12.39	11.48	13.17	13.33	15.53	16.96	18.41

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

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

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(57)

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

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

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

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

(59)

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

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

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

(62)m=	173.34	152.94	160.99	144.82	142.29	127.67	123.11	134.4	133.95	150.15	158.13	169.34	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	173.34	152.94	160.99	144.82	142.29	127.67	123.11	134.4	133.95	150.15	158.13	169.34	

Output from water heater (annual)$_{1...12}$ 1771.11 (64)

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

(65)m=	79.42	70.53	75.31	69.23	69.09	63.53	62.72	66.47	65.62	71.71	73.66	78.09	(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=	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	91.57	(66)

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

(67)m=	14.23	12.64	10.28	7.78	5.82	4.91	5.31	6.9	9.26	11.76	13.72	14.63	(67)

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

(68)m=	159.67	161.33	157.15	148.26	137.04	126.5	119.45	117.8	121.97	130.86	142.08	152.62	(68)

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

(69)m=	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	32.16	(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=	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	-73.26	(71)

Water heating gains (Table 5)

(72)m=	106.75	104.95	101.22	96.16	92.87	88.24	84.3	89.34	91.14	96.38	102.3	104.96	(72)

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

(73)m=	334.12	332.39	322.13	305.68	289.2	273.12	262.53	267.51	275.84	292.47	311.58	325.69	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	3.9	x	19.64	x	0.63	x	0.7	=	23.41	(76)
East	0.9x	0.77	x	3.9	x	38.42	x	0.63	x	0.7	=	45.79	(76)
East	0.9x	0.77	x	3.9	x	63.27	x	0.63	x	0.7	=	75.41	(76)
East	0.9x	0.77	x	3.9	x	92.28	x	0.63	x	0.7	=	109.99	(76)
East	0.9x	0.77	x	3.9	x	113.09	x	0.63	x	0.7	=	134.79	(76)

East	0.9x	0.77	x	3.9	x	115.77	x	0.63	x	0.7	=	137.99	(76)
East	0.9x	0.77	x	3.9	x	110.22	x	0.63	x	0.7	=	131.37	(76)
East	0.9x	0.77	x	3.9	x	94.68	x	0.63	x	0.7	=	112.84	(76)
East	0.9x	0.77	x	3.9	x	73.59	x	0.63	x	0.7	=	87.71	(76)
East	0.9x	0.77	x	3.9	x	45.59	x	0.63	x	0.7	=	54.34	(76)
East	0.9x	0.77	x	3.9	x	24.49	x	0.63	x	0.7	=	29.19	(76)
East	0.9x	0.77	x	3.9	x	16.15	x	0.63	x	0.7	=	19.25	(76)
West	0.9x	0.77	x	5.6	x	19.64	x	0.63	x	0.7	=	33.61	(80)
West	0.9x	0.77	x	1.43	x	19.64	x	0.63	x	0.7	=	8.58	(80)
West	0.9x	0.77	x	5.6	x	38.42	x	0.63	x	0.7	=	65.75	(80)
West	0.9x	0.77	x	1.43	x	38.42	x	0.63	x	0.7	=	16.79	(80)
West	0.9x	0.77	x	5.6	x	63.27	x	0.63	x	0.7	=	108.29	(80)
West	0.9x	0.77	x	1.43	x	63.27	x	0.63	x	0.7	=	27.65	(80)
West	0.9x	0.77	x	5.6	x	92.28	x	0.63	x	0.7	=	157.93	(80)
West	0.9x	0.77	x	1.43	x	92.28	x	0.63	x	0.7	=	40.33	(80)
West	0.9x	0.77	x	5.6	x	113.09	x	0.63	x	0.7	=	193.55	(80)
West	0.9x	0.77	x	1.43	x	113.09	x	0.63	x	0.7	=	49.42	(80)
West	0.9x	0.77	x	5.6	x	115.77	x	0.63	x	0.7	=	198.13	(80)
West	0.9x	0.77	x	1.43	x	115.77	x	0.63	x	0.7	=	50.59	(80)
West	0.9x	0.77	x	5.6	x	110.22	x	0.63	x	0.7	=	188.63	(80)
West	0.9x	0.77	x	1.43	x	110.22	x	0.63	x	0.7	=	48.17	(80)
West	0.9x	0.77	x	5.6	x	94.68	x	0.63	x	0.7	=	162.03	(80)
West	0.9x	0.77	x	1.43	x	94.68	x	0.63	x	0.7	=	41.38	(80)
West	0.9x	0.77	x	5.6	x	73.59	x	0.63	x	0.7	=	125.94	(80)
West	0.9x	0.77	x	1.43	x	73.59	x	0.63	x	0.7	=	32.16	(80)
West	0.9x	0.77	x	5.6	x	45.59	x	0.63	x	0.7	=	78.02	(80)
West	0.9x	0.77	x	1.43	x	45.59	x	0.63	x	0.7	=	19.92	(80)
West	0.9x	0.77	x	5.6	x	24.49	x	0.63	x	0.7	=	41.91	(80)
West	0.9x	0.77	x	1.43	x	24.49	x	0.63	x	0.7	=	10.7	(80)
West	0.9x	0.77	x	5.6	x	16.15	x	0.63	x	0.7	=	27.64	(80)
West	0.9x	0.77	x	1.43	x	16.15	x	0.63	x	0.7	=	7.06	(80)

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

(83)m=	65.61	128.34	211.35	308.25	377.77	386.71	368.17	316.25	245.81	152.28	81.8	53.95	(83)

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

(84)m=	399.73	460.73	533.48	613.92	666.97	659.83	630.7	583.76	521.65	444.75	393.38	379.64	(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	0.97	0.92	0.79	0.6	0.44	0.5	0.76	0.95	0.99	1	(86)

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

(87)m=	19.8	19.97	20.26	20.62	20.87	20.97	20.99	20.99	20.92	20.57	20.12	19.77	(87)

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

(88)m=	19.91	19.92	19.92	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.93	19.92	(88)

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

(89)m=	0.99	0.99	0.96	0.89	0.73	0.51	0.34	0.39	0.67	0.93	0.99	1	(89)

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

(90)m=	18.34	18.58	19	19.5	19.81	19.93	19.94	19.94	19.88	19.45	18.81	18.3	(90)

fLA = Living area ÷ (4) = 0.48 (91)

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

(92)m=	19.04	19.25	19.61	20.04	20.32	20.43	20.45	20.45	20.38	19.99	19.44	19.01	(92)

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

(93)m=	19.04	19.25	19.61	20.04	20.32	20.43	20.45	20.45	20.38	19.99	19.44	19.01	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.96	0.89	0.75	0.55	0.39	0.44	0.71	0.93	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	396.55	453.41	512.47	547.14	500.39	364.13	245.55	256.65	371.36	414.43	387.21	377.24	(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=	974.91	946.76	862.52	724.26	559.14	374.25	247	259.24	404.64	609.33	804.36	969.72	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	430.3	331.53	260.44	127.53	43.71	0	0	0	0	145	300.34	440.81	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 2079.66 (98)

Space heating requirement in kWh/m²/year 37.95 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	430.3	331.53	260.44	127.53	43.71	0	0	0	0	145	300.34	440.81	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	460.21	354.58	278.54	136.4	46.75	0	0	0	0	155.08	321.22	471.45	

Total (kWh/year) =$Sum(211)_{1...5,10....12}$= 2224.24 (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)

TER WorkSheet: New dwelling design stage

Water heating

Output from water heater (calculated above)

173.34	152.94	160.99	144.82	142.29	127.67	123.11	134.4	133.95	150.15	158.13	169.34

Efficiency of water heater 79.8 (216)

(217)m=	87.14	86.82	86.09	84.48	82.08	79.8	79.8	79.8	79.8	84.72	86.5	87.25	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	198.91	176.15	187	171.43	173.35	159.98	154.28	168.42	167.85	177.22	182.8	194.08

Total = Sum(219a)$_{1...12}$ = 2111.48 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2224.24	
Water heating fuel used		2111.48	
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		251.39	(232)

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	=	480.44	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	456.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =			936.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	130.47	(268)
Total CO2, kg/year		sum of (265)…(271) =		1105.91	(272)

TER = 29.58 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:38:46

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.3m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 007

Address : AC 007, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	30.06 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	9.49 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

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

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: East	4.91m²	
Windows facing: West	7.06m²	
Windows facing: West	2.69m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features	
Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 007

Address : AC 007, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.3	(1a) x	2.9	(2a) =	151.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.3	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	151.67	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

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

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

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

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

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

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

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

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

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

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

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.93	x	1.4	=	4.102			(26)
Windows Type 1			4.91	x1/[1/(1.4)+ 0.04]		=	6.51			(27)
Windows Type 2			7.06	x1/[1/(1.4)+ 0.04]		=	9.36			(27)
Windows Type 3			2.69	x1/[1/(1.4)+ 0.04]		=	3.57			(27)
Floor			52.3	x	0.12	=	6.276			(28)
Walls	34.63	17.59	17.04	x	0.12	=	2.04			(29)
Total area of elements, m²			86.93							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 31.86 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 9.61 (36)

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

Total fabric heat loss (33) + (36) = 41.47 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	11.31	11.2	11.09	10.56	10.45	9.92	9.92	9.82	10.14	10.45	10.67	10.88	(38)

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

(39)m=	52.78	52.67	52.56	52.03	51.92	51.39	51.39	51.29	51.61	51.92	52.14	52.35	

Average = Sum(39)$_{1…12}$ /12= 52 (39)

DER WorkSheet: New dwelling design stage

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

(40)m=	1.01	1.01	1.01	0.99	0.99	0.98	0.98	0.98	0.99	0.99	1	1

Average = Sum(40)$_{1…12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.76 (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 75.95 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	83.55	80.51	77.47	74.43	71.39	68.36	68.36	71.39	74.43	77.47	80.51	83.55

Total = Sum(44)$_{1…12}$ = 911.41 (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=	123.9	108.36	111.82	97.49	93.54	80.72	74.8	85.83	86.86	101.22	110.49	119.99

Total = Sum(45)$_{1…12}$ = 1195 (45)

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

(46)m=	18.58	16.25	16.77	14.62	14.03	12.11	11.22	12.87	13.03	15.18	16.57	18	(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) = 110 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

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

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

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

DER WorkSheet: New dwelling design stage

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

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

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

(62)m=	179.17	158.29	167.09	150.98	148.82	134.21	130.07	141.11	140.35	156.5	163.99	175.26	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	179.17	158.29	167.09	150.98	148.82	134.21	130.07	141.11	140.35	156.5	163.99	175.26	

Output from water heater (annual)1…12 | 1845.84 | (64)

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

(65)m=	85.42	75.97	81.4	75.21	75.32	69.63	69.09	72.76	71.67	77.88	79.53	84.12	(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=	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	(66)

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

(67)m=	13.66	12.13	9.87	7.47	5.58	4.71	5.09	6.62	8.89	11.28	13.17	14.04	(67)

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

(68)m=	153.2	154.79	150.79	142.26	131.49	121.37	114.61	113.02	117.03	125.56	136.33	146.44	(68)

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

(69)m=	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	(71)

Water heating gains (Table 5)

(72)m=	114.81	113.05	109.41	104.46	101.24	96.71	92.86	97.8	99.55	104.67	110.46	113.06	(72)

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

(73)m=	331.04	329.35	319.43	303.55	287.69	272.17	261.94	266.81	274.83	290.89	309.33	322.91	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	4.91	x	19.64	x	0.4	x	0.8	=	21.39	(76)
East	0.9x	0.77	x	4.91	x	38.42	x	0.4	x	0.8	=	41.83	(76)
East	0.9x	0.77	x	4.91	x	63.27	x	0.4	x	0.8	=	68.89	(76)
East	0.9x	0.77	x	4.91	x	92.28	x	0.4	x	0.8	=	100.48	(76)
East	0.9x	0.77	x	4.91	x	113.09	x	0.4	x	0.8	=	123.14	(76)

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East	0.9x	0.77	x	4.91	x	115.77	x	0.4	x	0.8	=	126.06	(76)
East	0.9x	0.77	x	4.91	x	110.22	x	0.4	x	0.8	=	120.01	(76)
East	0.9x	0.77	x	4.91	x	94.68	x	0.4	x	0.8	=	103.09	(76)
East	0.9x	0.77	x	4.91	x	73.59	x	0.4	x	0.8	=	80.13	(76)
East	0.9x	0.77	x	4.91	x	45.59	x	0.4	x	0.8	=	49.64	(76)
East	0.9x	0.77	x	4.91	x	24.49	x	0.4	x	0.8	=	26.66	(76)
East	0.9x	0.77	x	4.91	x	16.15	x	0.4	x	0.8	=	17.59	(76)
West	0.9x	0.77	x	7.06	x	19.64	x	0.4	x	0.8	=	30.75	(80)
West	0.9x	0.77	x	2.69	x	19.64	x	0.4	x	0.8	=	11.72	(80)
West	0.9x	0.77	x	7.06	x	38.42	x	0.4	x	0.8	=	60.15	(80)
West	0.9x	0.77	x	2.69	x	38.42	x	0.4	x	0.8	=	22.92	(80)
West	0.9x	0.77	x	7.06	x	63.27	x	0.4	x	0.8	=	99.06	(80)
West	0.9x	0.77	x	2.69	x	63.27	x	0.4	x	0.8	=	37.74	(80)
West	0.9x	0.77	x	7.06	x	92.28	x	0.4	x	0.8	=	144.48	(80)
West	0.9x	0.77	x	2.69	x	92.28	x	0.4	x	0.8	=	55.05	(80)
West	0.9x	0.77	x	7.06	x	113.09	x	0.4	x	0.8	=	177.06	(80)
West	0.9x	0.77	x	2.69	x	113.09	x	0.4	x	0.8	=	67.46	(80)
West	0.9x	0.77	x	7.06	x	115.77	x	0.4	x	0.8	=	181.25	(80)
West	0.9x	0.77	x	2.69	x	115.77	x	0.4	x	0.8	=	69.06	(80)
West	0.9x	0.77	x	7.06	x	110.22	x	0.4	x	0.8	=	172.56	(80)
West	0.9x	0.77	x	2.69	x	110.22	x	0.4	x	0.8	=	65.75	(80)
West	0.9x	0.77	x	7.06	x	94.68	x	0.4	x	0.8	=	148.23	(80)
West	0.9x	0.77	x	2.69	x	94.68	x	0.4	x	0.8	=	56.48	(80)
West	0.9x	0.77	x	7.06	x	73.59	x	0.4	x	0.8	=	115.21	(80)
West	0.9x	0.77	x	2.69	x	73.59	x	0.4	x	0.8	=	43.9	(80)
West	0.9x	0.77	x	7.06	x	45.59	x	0.4	x	0.8	=	71.38	(80)
West	0.9x	0.77	x	2.69	x	45.59	x	0.4	x	0.8	=	27.2	(80)
West	0.9x	0.77	x	7.06	x	24.49	x	0.4	x	0.8	=	38.34	(80)
West	0.9x	0.77	x	2.69	x	24.49	x	0.4	x	0.8	=	14.61	(80)
West	0.9x	0.77	x	7.06	x	16.15	x	0.4	x	0.8	=	25.29	(80)
West	0.9x	0.77	x	2.69	x	16.15	x	0.4	x	0.8	=	9.63	(80)

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

(83)m=	63.85	124.91	205.7	300	367.66	376.37	358.32	307.79	239.24	148.21	79.61	52.51	(83)

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

(84)m=	394.89	454.25	525.13	603.56	655.35	648.54	620.26	574.6	514.07	439.1	388.94	375.42	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.96	0.87	0.7	0.5	0.36	0.41	0.66	0.92	0.99	1	(86)

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

(87)m=	20.1	20.26	20.52	20.8	20.95	20.99	21	21	20.97	20.75	20.37	20.07	(87)

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

(88)m=	20.08	20.08	20.08	20.09	20.09	20.1	20.1	20.1	20.09	20.09	20.09	20.08	(88)

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

(89)m=	0.99	0.98	0.95	0.83	0.64	0.43	0.29	0.33	0.59	0.89	0.98	0.99	(89)

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

(90)m=	18.89	19.12	19.49	19.87	20.05	20.09	20.1	20.1	20.08	19.82	19.29	18.84	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.45	19.66	19.97	20.31	20.47	20.52	20.52	20.52	20.5	20.26	19.79	19.42	(92)

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

(93)m=	19.45	19.66	19.97	20.31	20.47	20.52	20.52	20.52	20.5	20.26	19.79	19.42	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.94	0.84	0.67	0.47	0.32	0.37	0.62	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	390.98	444.63	495.68	508.55	436.03	301.87	201.23	210.88	320.05	395.23	380.72	372.52	(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=	799.76	777.21	708.27	593.66	455.44	304.02	201.46	211.32	330.05	501.34	661.82	796.57	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	304.13	223.49	158.17	61.28	14.44	0	0	0	0	78.95	202.4	315.5	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1358.36 (98)

Space heating requirement in kWh/m²/year 25.97 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1358.36	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1494.19	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308

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Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement		1845.84	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2030.42	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	35.25	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		115.65	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	115.65	(331)
Energy for lighting (calculated in Appendix L)		241.21	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-540.63	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	573.44	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.29	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	591.73	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				591.73	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	60.02	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	125.19	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-280.58	(380)
Total CO2, kg/year	sum of (376)…(382) =				496.36	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				9.49	(384)
EI rating (section 14)					93.16	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 007

Address : AC 007, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.3	(1a) x	2.9	(2a) =	151.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		151.67	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.32	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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

0.41	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.37	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.93	x	1.2	=	3.516			(26)
Windows Type 1			3.4	x1/[1/(1.4)+ 0.04]		=	4.51			(27)
Windows Type 2			4.89	x1/[1/(1.4)+ 0.04]		=	6.48			(27)
Windows Type 3			1.86	x1/[1/(1.4)+ 0.04]		=	2.47			(27)
Floor			52.3	x	0.13	=	6.799			(28)
Walls	34.63	13.08	21.55	x	0.18	=	3.88			(29)
Total area of elements, m²			86.93							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 27.65 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.46 (36)

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

Total fabric heat loss (33) + (36) = 34.11 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.31	29.15	28.98	28.22	28.07	27.41	27.41	27.28	27.66	28.07	28.36	28.67	(38)

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

(39)m=	63.43	63.26	63.1	62.33	62.19	61.52	61.52	61.4	61.78	62.19	62.48	62.78	

Average = Sum(39)$_{1…12}$ /12= 62.33 (39)

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

(40)m=	1.21	1.21	1.21	1.19	1.19	1.18	1.18	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 1.76 (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 75.95 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	83.55	80.51	77.47	74.43	71.39	68.36	68.36	71.39	74.43	77.47	80.51	83.55

Total = Sum(44)$_{1…12}$ = 911.41 (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=	123.9	108.36	111.82	97.49	93.54	80.72	74.8	85.83	86.86	101.22	110.49	119.99

Total = Sum(45)$_{1…12}$ = 1195 (45)

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

(46)m=	18.58	16.25	16.77	14.62	14.03	12.11	11.22	12.87	13.03	15.18	16.57	18	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

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

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

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

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

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

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

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

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

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

(62)m=	170.49	150.45	158.41	142.58	140.13	125.81	121.39	132.43	131.95	147.82	155.58	166.58	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	170.49	150.45	158.41	142.58	140.13	125.81	121.39	132.43	131.95	147.82	155.58	166.58	

Output from water heater (annual)$_{1...12}$ 1743.62 (64)

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

(65)m=	78.47	69.7	74.46	68.49	68.38	62.91	62.15	65.81	64.95	70.93	72.81	77.17	(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=	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	(66)

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

(67)m=	13.66	12.13	9.87	7.47	5.58	4.71	5.09	6.62	8.89	11.28	13.17	14.04	(67)

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

(68)m=	153.2	154.79	150.79	142.26	131.49	121.37	114.61	113.02	117.03	125.56	136.33	146.44	(68)

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

(69)m=	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	31.79	(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=	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	-70.32	(71)

Water heating gains (Table 5)

(72)m=	105.47	103.72	100.07	95.12	91.91	87.38	83.53	88.46	90.21	95.34	101.13	103.73	(72)

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

(73)m=	324.7	323.01	313.1	297.22	281.35	265.83	255.61	260.47	268.5	284.55	302.99	316.58	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	3.4	x	19.64	x	0.63	x	0.7	=	20.41	(76)
East	0.9x	0.77	x	3.4	x	38.42	x	0.63	x	0.7	=	39.92	(76)
East	0.9x	0.77	x	3.4	x	63.27	x	0.63	x	0.7	=	65.75	(76)
East	0.9x	0.77	x	3.4	x	92.28	x	0.63	x	0.7	=	95.89	(76)
East	0.9x	0.77	x	3.4	x	113.09	x	0.63	x	0.7	=	117.51	(76)

East	0.9x	0.77	x	3.4	x	115.77	x	0.63	x	0.7	=	120.3	(76)
East	0.9x	0.77	x	3.4	x	110.22	x	0.63	x	0.7	=	114.53	(76)
East	0.9x	0.77	x	3.4	x	94.68	x	0.63	x	0.7	=	98.38	(76)
East	0.9x	0.77	x	3.4	x	73.59	x	0.63	x	0.7	=	76.47	(76)
East	0.9x	0.77	x	3.4	x	45.59	x	0.63	x	0.7	=	47.37	(76)
East	0.9x	0.77	x	3.4	x	24.49	x	0.63	x	0.7	=	25.45	(76)
East	0.9x	0.77	x	3.4	x	16.15	x	0.63	x	0.7	=	16.78	(76)
West	0.9x	0.77	x	4.89	x	19.64	x	0.63	x	0.7	=	29.35	(80)
West	0.9x	0.77	x	1.86	x	19.64	x	0.63	x	0.7	=	11.16	(80)
West	0.9x	0.77	x	4.89	x	38.42	x	0.63	x	0.7	=	57.42	(80)
West	0.9x	0.77	x	1.86	x	38.42	x	0.63	x	0.7	=	21.84	(80)
West	0.9x	0.77	x	4.89	x	63.27	x	0.63	x	0.7	=	94.56	(80)
West	0.9x	0.77	x	1.86	x	63.27	x	0.63	x	0.7	=	35.97	(80)
West	0.9x	0.77	x	4.89	x	92.28	x	0.63	x	0.7	=	137.91	(80)
West	0.9x	0.77	x	1.86	x	92.28	x	0.63	x	0.7	=	52.46	(80)
West	0.9x	0.77	x	4.89	x	113.09	x	0.63	x	0.7	=	169.01	(80)
West	0.9x	0.77	x	1.86	x	113.09	x	0.63	x	0.7	=	64.29	(80)
West	0.9x	0.77	x	4.89	x	115.77	x	0.63	x	0.7	=	173.01	(80)
West	0.9x	0.77	x	1.86	x	115.77	x	0.63	x	0.7	=	65.81	(80)
West	0.9x	0.77	x	4.89	x	110.22	x	0.63	x	0.7	=	164.72	(80)
West	0.9x	0.77	x	1.86	x	110.22	x	0.63	x	0.7	=	62.65	(80)
West	0.9x	0.77	x	4.89	x	94.68	x	0.63	x	0.7	=	141.49	(80)
West	0.9x	0.77	x	1.86	x	94.68	x	0.63	x	0.7	=	53.82	(80)
West	0.9x	0.77	x	4.89	x	73.59	x	0.63	x	0.7	=	109.98	(80)
West	0.9x	0.77	x	1.86	x	73.59	x	0.63	x	0.7	=	41.83	(80)
West	0.9x	0.77	x	4.89	x	45.59	x	0.63	x	0.7	=	68.13	(80)
West	0.9x	0.77	x	1.86	x	45.59	x	0.63	x	0.7	=	25.91	(80)
West	0.9x	0.77	x	4.89	x	24.49	x	0.63	x	0.7	=	36.6	(80)
West	0.9x	0.77	x	1.86	x	24.49	x	0.63	x	0.7	=	13.92	(80)
West	0.9x	0.77	x	4.89	x	16.15	x	0.63	x	0.7	=	24.14	(80)
West	0.9x	0.77	x	1.86	x	16.15	x	0.63	x	0.7	=	9.18	(80)

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

(83)m=	60.92	119.18	196.27	286.25	350.81	359.12	341.89	293.68	228.27	141.42	75.96	50.1	(83)

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

(84)m=	385.63	442.19	509.37	583.47	632.16	624.95	597.5	554.16	496.77	425.97	378.95	366.68	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.97	0.92	0.79	0.6	0.45	0.5	0.76	0.95	0.99	1	(86)

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

(87)m=	19.8	19.97	20.25	20.61	20.86	20.97	20.99	20.99	20.91	20.57	20.12	19.77	(87)

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

(88)m=	19.91	19.91	19.91	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.92	19.92	(88)

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

(89)m=	0.99	0.99	0.96	0.89	0.73	0.51	0.34	0.39	0.68	0.93	0.99	0.99	(89)

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

(90)m=	18.33	18.58	18.99	19.49	19.8	19.92	19.94	19.94	19.87	19.45	18.81	18.3	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.02	19.23	19.58	20.01	20.3	20.41	20.43	20.43	20.36	19.97	19.42	18.99	(92)

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

(93)m=	19.02	19.23	19.58	20.01	20.3	20.41	20.43	20.43	20.36	19.97	19.42	18.99	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.96	0.89	0.75	0.56	0.39	0.44	0.71	0.93	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	382.41	435	489.29	520.88	476.76	347.54	234.32	244.92	354.41	396.64	372.79	364.23	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	933.61	906.41	825.44	692.71	534.67	357.64	235.78	247.49	386.75	582.91	769.95	928.47	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	410.09	316.79	250.1	123.72	43.08	0	0	0	0	138.59	285.95	419.79	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1988.11 (98)

Space heating requirement in kWh/m²/year 38.01 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	410.09	316.79	250.1	123.72	43.08	0	0	0	0	138.59	285.95	419.79	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	438.6	338.81	267.48	132.32	46.08	0	0	0	0	148.22	305.83	448.97	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2126.32 (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)

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Water heating

Output from water heater (calculated above)

170.49	150.45	158.41	142.58	140.13	125.81	121.39	132.43	131.95	147.82	155.58	166.58

Efficiency of water heater 79.8 (216)

(217)m=	87.07	86.75	86.03	84.44	82.08	79.8	79.8	79.8	79.8	84.64	86.42	87.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	195.81	173.42	184.14	168.85	170.73	157.66	152.12	165.95	165.35	174.64	180.04	191.08

Total = Sum(219a)$_{1...12}$ = 2079.77 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2126.32	
Water heating fuel used		2079.77	
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		241.21	(232)

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	=	459.29	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	449.23	(264)
Space and water heating	(261) + (262) + (263) + (264) =			908.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	125.19	(268)
Total CO2, kg/year		sum of (265)…(271) =		1072.63	(272)

TER = 30.06 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:38:55

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 89.3m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 008

Address : AC 008, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	26.65 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	7.22 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	49.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: West	2.24m²	
Windows facing: North	11.21m²	
Windows facing: West	1.8m²	
Windows facing: West	1.8m²	
Windows facing: North	2.69m²	
Windows facing: West	3.44m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features	
Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 008

Address : AC 008, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	89.3	(1a) x	2.9	(2a) =	258.97	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.3	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	258.97	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(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

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

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

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

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

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

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

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

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

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

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 2			11.21	x1/[1/(1.4)+ 0.04] =	14.86			(27)
Windows Type 3			1.8	x1/[1/(1.4)+ 0.04] =	2.39			(27)
Windows Type 4			1.8	x1/[1/(1.4)+ 0.04] =	2.39			(27)
Windows Type 5			2.69	x1/[1/(1.4)+ 0.04] =	3.57			(27)
Windows Type 6			3.44	x1/[1/(1.4)+ 0.04] =	4.56			(27)
Floor			89.3	x 0.12 =	10.716			(28)
Walls	59.25	23.18	36.07	x 0.12 =	4.33			(29)
Total area of elements, m²			148.55					(31)
Party wall			49.76	x 0 =	0			(32)

** 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) = 45.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 13.25 (36)

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

Total fabric heat loss (33) + (36) = 59.02 (37)

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

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

(38)m=	19.3	19.12	18.94	18.03	17.85	16.94	16.94	16.76	17.31	17.85	18.21	18.58	(38)

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

(39)m=	78.33	78.15	77.96	77.06	76.87	75.97	75.97	75.79	76.33	76.87	77.24	77.6	

Average = Sum(39)$_{1...12}$ /12= 77.01 (39)

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

(40)m=	0.88	0.88	0.87	0.86	0.86	0.85	0.85	0.85	0.85	0.86	0.86	0.87	

Average = Sum(40)$_{1...12}$ /12= 0.86 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.62 (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 96.33 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	105.96	102.11	98.26	94.4	90.55	86.7	86.7	90.55	94.4	98.26	102.11	105.96	

Total = Sum(44)$_{1...12}$ = 1155.96 (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=	157.14	137.44	141.82	123.64	118.64	102.38	94.87	108.86	110.16	128.38	140.14	152.18	

Total = Sum(45)$_{1...12}$ = 1515.65 (45)

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

(46)m=	23.57	20.62	21.27	18.55	17.8	15.36	14.23	16.33	16.52	19.26	21.02	22.83	(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) = 110 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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

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

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

(62)m=	212.42	187.36	197.1	177.14	173.92	155.87	150.14	164.14	163.66	183.66	193.63	207.46	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	212.42	187.36	197.1	177.14	173.92	155.87	150.14	164.14	163.66	183.66	193.63	207.46	

Output from water heater (annual)$_{1...12}$ | 2166.49 | (64)

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

(65)m=	96.47	85.64	91.38	83.91	83.67	76.84	75.76	80.42	79.42	86.91	89.39	94.82	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	(66)

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

(67)m=	21.2	18.83	15.31	11.59	8.67	7.32	7.9	10.28	13.79	17.51	20.44	21.79	(67)

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

(68)m=	237.78	240.25	234.03	220.8	204.09	188.38	177.89	175.42	181.64	194.88	211.59	227.29	(68)

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

(69)m=	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	(71)

Water heating gains (Table 5)

(72)m=	129.66	127.44	122.82	116.54	112.46	106.72	101.83	108.09	110.31	116.81	124.15	127.45	(72)

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

(73)m=	450.89	448.76	434.41	411.17	387.45	364.65	349.87	356.03	367.98	391.44	418.42	438.77	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	11.21	x	10.63	x	0.4	x	0.8	=	26.43	(74)
North	0.9x	0.77	x	2.69	x	10.63	x	0.4	x	0.8	=	6.34	(74)

North	0.9x	0.77	x	11.21	x	20.32	x	0.4	x	0.8	=	50.52	(74)
North	0.9x	0.77	x	2.69	x	20.32	x	0.4	x	0.8	=	12.12	(74)
North	0.9x	0.77	x	11.21	x	34.53	x	0.4	x	0.8	=	85.84	(74)
North	0.9x	0.77	x	2.69	x	34.53	x	0.4	x	0.8	=	20.6	(74)
North	0.9x	0.77	x	11.21	x	55.46	x	0.4	x	0.8	=	137.88	(74)
North	0.9x	0.77	x	2.69	x	55.46	x	0.4	x	0.8	=	33.09	(74)
North	0.9x	0.77	x	11.21	x	74.72	x	0.4	x	0.8	=	185.74	(74)
North	0.9x	0.77	x	2.69	x	74.72	x	0.4	x	0.8	=	44.57	(74)
North	0.9x	0.77	x	11.21	x	79.99	x	0.4	x	0.8	=	198.84	(74)
North	0.9x	0.77	x	2.69	x	79.99	x	0.4	x	0.8	=	47.71	(74)
North	0.9x	0.77	x	11.21	x	74.68	x	0.4	x	0.8	=	185.64	(74)
North	0.9x	0.77	x	2.69	x	74.68	x	0.4	x	0.8	=	44.55	(74)
North	0.9x	0.77	x	11.21	x	59.25	x	0.4	x	0.8	=	147.28	(74)
North	0.9x	0.77	x	2.69	x	59.25	x	0.4	x	0.8	=	35.34	(74)
North	0.9x	0.77	x	11.21	x	41.52	x	0.4	x	0.8	=	103.21	(74)
North	0.9x	0.77	x	2.69	x	41.52	x	0.4	x	0.8	=	24.77	(74)
North	0.9x	0.77	x	11.21	x	24.19	x	0.4	x	0.8	=	60.13	(74)
North	0.9x	0.77	x	2.69	x	24.19	x	0.4	x	0.8	=	14.43	(74)
North	0.9x	0.77	x	11.21	x	13.12	x	0.4	x	0.8	=	32.61	(74)
North	0.9x	0.77	x	2.69	x	13.12	x	0.4	x	0.8	=	7.83	(74)
North	0.9x	0.77	x	11.21	x	8.86	x	0.4	x	0.8	=	22.04	(74)
North	0.9x	0.77	x	2.69	x	8.86	x	0.4	x	0.8	=	5.29	(74)
West	0.9x	0.77	x	2.24	x	19.64	x	0.4	x	0.8	=	9.76	(80)
West	0.9x	0.77	x	1.8	x	19.64	x	0.4	x	0.8	=	7.84	(80)
West	0.9x	0.77	x	1.8	x	19.64	x	0.4	x	0.8	=	7.84	(80)
West	0.9x	0.77	x	3.44	x	19.64	x	0.4	x	0.8	=	14.98	(80)
West	0.9x	0.77	x	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(80)
West	0.9x	0.77	x	1.8	x	38.42	x	0.4	x	0.8	=	15.34	(80)
West	0.9x	0.77	x	1.8	x	38.42	x	0.4	x	0.8	=	15.34	(80)
West	0.9x	0.77	x	3.44	x	38.42	x	0.4	x	0.8	=	29.31	(80)
West	0.9x	0.77	x	2.24	x	63.27	x	0.4	x	0.8	=	31.43	(80)
West	0.9x	0.77	x	1.8	x	63.27	x	0.4	x	0.8	=	25.26	(80)
West	0.9x	0.77	x	1.8	x	63.27	x	0.4	x	0.8	=	25.26	(80)
West	0.9x	0.77	x	3.44	x	63.27	x	0.4	x	0.8	=	48.27	(80)
West	0.9x	0.77	x	2.24	x	92.28	x	0.4	x	0.8	=	45.84	(80)
West	0.9x	0.77	x	1.8	x	92.28	x	0.4	x	0.8	=	36.84	(80)
West	0.9x	0.77	x	1.8	x	92.28	x	0.4	x	0.8	=	36.84	(80)
West	0.9x	0.77	x	3.44	x	92.28	x	0.4	x	0.8	=	70.4	(80)
West	0.9x	0.77	x	2.24	x	113.09	x	0.4	x	0.8	=	56.18	(80)
West	0.9x	0.77	x	1.8	x	113.09	x	0.4	x	0.8	=	45.14	(80)
West	0.9x	0.77	x	1.8	x	113.09	x	0.4	x	0.8	=	45.14	(80)

West	0.9x	0.77	x	3.44	x	113.09	x	0.4	x	0.8	=	86.27	(80)
West	0.9x	0.77	x	2.24	x	115.77	x	0.4	x	0.8	=	57.51	(80)
West	0.9x	0.77	x	1.8	x	115.77	x	0.4	x	0.8	=	46.21	(80)
West	0.9x	0.77	x	1.8	x	115.77	x	0.4	x	0.8	=	46.21	(80)
West	0.9x	0.77	x	3.44	x	115.77	x	0.4	x	0.8	=	88.32	(80)
West	0.9x	0.77	x	2.24	x	110.22	x	0.4	x	0.8	=	54.75	(80)
West	0.9x	0.77	x	1.8	x	110.22	x	0.4	x	0.8	=	44	(80)
West	0.9x	0.77	x	1.8	x	110.22	x	0.4	x	0.8	=	44	(80)
West	0.9x	0.77	x	3.44	x	110.22	x	0.4	x	0.8	=	84.08	(80)
West	0.9x	0.77	x	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(80)
West	0.9x	0.77	x	1.8	x	94.68	x	0.4	x	0.8	=	37.79	(80)
West	0.9x	0.77	x	1.8	x	94.68	x	0.4	x	0.8	=	37.79	(80)
West	0.9x	0.77	x	3.44	x	94.68	x	0.4	x	0.8	=	72.22	(80)
West	0.9x	0.77	x	2.24	x	73.59	x	0.4	x	0.8	=	36.55	(80)
West	0.9x	0.77	x	1.8	x	73.59	x	0.4	x	0.8	=	29.37	(80)
West	0.9x	0.77	x	1.8	x	73.59	x	0.4	x	0.8	=	29.37	(80)
West	0.9x	0.77	x	3.44	x	73.59	x	0.4	x	0.8	=	56.14	(80)
West	0.9x	0.77	x	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(80)
West	0.9x	0.77	x	1.8	x	45.59	x	0.4	x	0.8	=	18.2	(80)
West	0.9x	0.77	x	1.8	x	45.59	x	0.4	x	0.8	=	18.2	(80)
West	0.9x	0.77	x	3.44	x	45.59	x	0.4	x	0.8	=	34.78	(80)
West	0.9x	0.77	x	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(80)
West	0.9x	0.77	x	1.8	x	24.49	x	0.4	x	0.8	=	9.78	(80)
West	0.9x	0.77	x	1.8	x	24.49	x	0.4	x	0.8	=	9.78	(80)
West	0.9x	0.77	x	3.44	x	24.49	x	0.4	x	0.8	=	18.68	(80)
West	0.9x	0.77	x	2.24	x	16.15	x	0.4	x	0.8	=	8.02	(80)
West	0.9x	0.77	x	1.8	x	16.15	x	0.4	x	0.8	=	6.45	(80)
West	0.9x	0.77	x	1.8	x	16.15	x	0.4	x	0.8	=	6.45	(80)
West	0.9x	0.77	x	3.44	x	16.15	x	0.4	x	0.8	=	12.32	(80)

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

(83)m=	73.2	141.71	236.65	360.87	463.05	484.8	457.01	377.46	279.42	168.38	90.83	60.56	(83)

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

(84)m=	524.08	590.47	671.06	772.04	850.5	849.45	806.88	733.49	647.4	559.82	509.25	499.33	(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	1	0.98	0.93	0.78	0.57	0.41	0.47	0.76	0.97	1	1	(86)

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

(87)m=	20.13	20.26	20.48	20.76	20.94	20.99	21	21	20.96	20.71	20.37	20.11	(87)

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

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

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

(89)m=	1	0.99	0.98	0.91	0.73	0.5	0.34	0.39	0.69	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=	19.02	19.2	19.53	19.93	20.15	20.21	20.21	20.21	20.18	19.87	19.38	18.99	(90)

fLA = Living area ÷ (4) = 0.39 (91)

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

(92)m=	19.45	19.61	19.89	20.25	20.45	20.51	20.51	20.51	20.48	20.19	19.76	19.42	(92)

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

(93)m=	19.45	19.61	19.89	20.25	20.45	20.51	20.51	20.51	20.48	20.19	19.76	19.42	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.98	0.91	0.75	0.52	0.37	0.42	0.72	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	522.35	586.09	655.67	703.92	634.61	445.45	297.07	311.13	464.96	533.08	505.35	498.09	(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=	1186.48	1149.57	1044.24	874.55	672.99	448.96	297.37	311.85	487.07	737.56	977.87	1181.14	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	494.11	378.66	289.1	122.85	28.56	0	0	0	0	152.13	340.21	508.19	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2313.82 (98)

Space heating requirement in kWh/m²/year 25.91 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		2313.82	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2545.2	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

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Water heating

Annual water heating requirement		2166.49	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2383.14	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	49.28	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		197.46	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	197.46	(331)
Energy for lighting (calculated in Appendix L)		374.37	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-923.21	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	801.82	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	25.58	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	827.4	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				827.4	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	102.48	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	194.3	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-479.15	(380)
Total CO2, kg/year	sum of (376)…(382) =				645.04	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				7.22	(384)
EI rating (section 14)					93.56	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 008

Address : AC 008, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	89.3	(1a) x	2.9	(2a) =	258.97	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.3	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	258.97	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31	(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

0.4	0.39	0.38	0.34	0.33	0.3	0.3	0.29	0.31	0.33	0.35	0.37

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(24d)

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

(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.16	x1/[1/(1.4)+ 0.04] =	2.86			(27)
Windows Type 2			10.8	x1/[1/(1.4)+ 0.04] =	14.32			(27)
Windows Type 3			1.73	x1/[1/(1.4)+ 0.04] =	2.29			(27)
Windows Type 4			1.73	x1/[1/(1.4)+ 0.04] =	2.29			(27)
Windows Type 5			2.59	x1/[1/(1.4)+ 0.04] =	3.43			(27)
Windows Type 6			3.31	x1/[1/(1.4)+ 0.04] =	4.39			(27)
Floor			89.3	x 0.13 =	11.609			(28)
Walls	59.25	22.32	36.93	x 0.18 =	6.65			(29)
Total area of elements, m²			148.55					(31)
Party wall			49.76	x 0 =	0			(32)

** 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) = 47.85 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 9.3 (36)

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

Total fabric heat loss (33) + (36) = 57.15 (37)

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

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

(38)m=	49.45	49.19	48.93	47.73	47.51	46.46	46.46	46.27	46.86	47.51	47.96	48.43	(38)

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

(39)m=	106.59	106.33	106.08	104.88	104.65	103.61	103.61	103.41	104.01	104.65	105.11	105.58

Average = $Sum(39)_{1...12}$ /12= 104.88 (39)

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

(40)m=	1.19	1.19	1.19	1.17	1.17	1.16	1.16	1.16	1.16	1.17	1.18	1.18

Average = $Sum(40)_{1...12}$ /12= 1.17 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.62 (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 96.33 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m=	105.96	102.11	98.26	94.4	90.55	86.7	86.7	90.55	94.4	98.26	102.11	105.96

Total = $Sum(44)_{1...12}$ = 1155.96 (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=	157.14	137.44	141.82	123.64	118.64	102.38	94.87	108.86	110.16	128.38	140.14	152.18

Total = $Sum(45)_{1...12}$ = 1515.65 (45)

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

(46)m=	23.57	20.62	21.27	18.55	17.8	15.36	14.23	16.33	16.52	19.26	21.02	22.83	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

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

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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

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

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

(62)m=	203.74	179.52	188.42	168.74	165.23	147.47	141.46	155.46	155.25	174.98	185.23	198.78	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	203.74	179.52	188.42	168.74	165.23	147.47	141.46	155.46	155.25	174.98	185.23	198.78

Output from water heater (annual)$_{1...12}$ | 2064.27 | (64)

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

(65)m=	89.53	79.37	84.43	77.19	76.72	70.11	68.82	73.47	72.7	79.96	82.67	87.88	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	130.8	(66)

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

(67)m=	21.2	18.83	15.31	11.59	8.67	7.32	7.9	10.28	13.79	17.51	20.44	21.79	(67)

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

(68)m=	237.78	240.25	234.03	220.8	204.09	188.38	177.89	175.42	181.64	194.88	211.59	227.29	(68)

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

(69)m=	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	(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=	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	-104.64	(71)

Water heating gains (Table 5)

(72)m=	120.33	118.1	113.48	107.2	103.12	97.38	92.5	98.75	100.98	107.48	114.82	118.11	(72)

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

(73)m=	444.55	442.42	428.07	404.83	381.12	358.32	343.53	349.69	361.65	385.11	412.09	432.43	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	10.8	x	10.63	x	0.63	x	0.7	=	35.1	(74)
North	0.9x	0.77	x	2.59	x	10.63	x	0.63	x	0.7	=	8.42	(74)

North	0.9x	0.77	x	10.8	x	20.32	x	0.63	x	0.7	=	67.07	(74)
North	0.9x	0.77	x	2.59	x	20.32	x	0.63	x	0.7	=	16.08	(74)
North	0.9x	0.77	x	10.8	x	34.53	x	0.63	x	0.7	=	113.97	(74)
North	0.9x	0.77	x	2.59	x	34.53	x	0.63	x	0.7	=	27.33	(74)
North	0.9x	0.77	x	10.8	x	55.46	x	0.63	x	0.7	=	183.07	(74)
North	0.9x	0.77	x	2.59	x	55.46	x	0.63	x	0.7	=	43.9	(74)
North	0.9x	0.77	x	10.8	x	74.72	x	0.63	x	0.7	=	246.61	(74)
North	0.9x	0.77	x	2.59	x	74.72	x	0.63	x	0.7	=	59.14	(74)
North	0.9x	0.77	x	10.8	x	79.99	x	0.63	x	0.7	=	264	(74)
North	0.9x	0.77	x	2.59	x	79.99	x	0.63	x	0.7	=	63.31	(74)
North	0.9x	0.77	x	10.8	x	74.68	x	0.63	x	0.7	=	246.48	(74)
North	0.9x	0.77	x	2.59	x	74.68	x	0.63	x	0.7	=	59.11	(74)
North	0.9x	0.77	x	10.8	x	59.25	x	0.63	x	0.7	=	195.55	(74)
North	0.9x	0.77	x	2.59	x	59.25	x	0.63	x	0.7	=	46.9	(74)
North	0.9x	0.77	x	10.8	x	41.52	x	0.63	x	0.7	=	137.03	(74)
North	0.9x	0.77	x	2.59	x	41.52	x	0.63	x	0.7	=	32.86	(74)
North	0.9x	0.77	x	10.8	x	24.19	x	0.63	x	0.7	=	79.84	(74)
North	0.9x	0.77	x	2.59	x	24.19	x	0.63	x	0.7	=	19.15	(74)
North	0.9x	0.77	x	10.8	x	13.12	x	0.63	x	0.7	=	43.3	(74)
North	0.9x	0.77	x	2.59	x	13.12	x	0.63	x	0.7	=	10.38	(74)
North	0.9x	0.77	x	10.8	x	8.86	x	0.63	x	0.7	=	29.26	(74)
North	0.9x	0.77	x	2.59	x	8.86	x	0.63	x	0.7	=	7.02	(74)
West	0.9x	0.77	x	2.16	x	19.64	x	0.63	x	0.7	=	12.97	(80)
West	0.9x	0.77	x	1.73	x	19.64	x	0.63	x	0.7	=	10.38	(80)
West	0.9x	0.77	x	1.73	x	19.64	x	0.63	x	0.7	=	10.38	(80)
West	0.9x	0.77	x	3.31	x	19.64	x	0.63	x	0.7	=	19.87	(80)
West	0.9x	0.77	x	2.16	x	38.42	x	0.63	x	0.7	=	25.36	(80)
West	0.9x	0.77	x	1.73	x	38.42	x	0.63	x	0.7	=	20.31	(80)
West	0.9x	0.77	x	1.73	x	38.42	x	0.63	x	0.7	=	20.31	(80)
West	0.9x	0.77	x	3.31	x	38.42	x	0.63	x	0.7	=	38.87	(80)
West	0.9x	0.77	x	2.16	x	63.27	x	0.63	x	0.7	=	41.77	(80)
West	0.9x	0.77	x	1.73	x	63.27	x	0.63	x	0.7	=	33.45	(80)
West	0.9x	0.77	x	1.73	x	63.27	x	0.63	x	0.7	=	33.45	(80)
West	0.9x	0.77	x	3.31	x	63.27	x	0.63	x	0.7	=	64.01	(80)
West	0.9x	0.77	x	2.16	x	92.28	x	0.63	x	0.7	=	60.92	(80)
West	0.9x	0.77	x	1.73	x	92.28	x	0.63	x	0.7	=	48.79	(80)
West	0.9x	0.77	x	1.73	x	92.28	x	0.63	x	0.7	=	48.79	(80)
West	0.9x	0.77	x	3.31	x	92.28	x	0.63	x	0.7	=	93.35	(80)
West	0.9x	0.77	x	2.16	x	113.09	x	0.63	x	0.7	=	74.66	(80)
West	0.9x	0.77	x	1.73	x	113.09	x	0.63	x	0.7	=	59.79	(80)
West	0.9x	0.77	x	1.73	x	113.09	x	0.63	x	0.7	=	59.79	(80)

West	0.9x	0.77	x	3.31	x	113.09	x	0.63	x	0.7	=	114.4	(80)
West	0.9x	0.77	x	2.16	x	115.77	x	0.63	x	0.7	=	76.42	(80)
West	0.9x	0.77	x	1.73	x	115.77	x	0.63	x	0.7	=	61.21	(80)
West	0.9x	0.77	x	1.73	x	115.77	x	0.63	x	0.7	=	61.21	(80)
West	0.9x	0.77	x	3.31	x	115.77	x	0.63	x	0.7	=	117.11	(80)
West	0.9x	0.77	x	2.16	x	110.22	x	0.63	x	0.7	=	72.76	(80)
West	0.9x	0.77	x	1.73	x	110.22	x	0.63	x	0.7	=	58.27	(80)
West	0.9x	0.77	x	1.73	x	110.22	x	0.63	x	0.7	=	58.27	(80)
West	0.9x	0.77	x	3.31	x	110.22	x	0.63	x	0.7	=	111.49	(80)
West	0.9x	0.77	x	2.16	x	94.68	x	0.63	x	0.7	=	62.5	(80)
West	0.9x	0.77	x	1.73	x	94.68	x	0.63	x	0.7	=	50.06	(80)
West	0.9x	0.77	x	1.73	x	94.68	x	0.63	x	0.7	=	50.06	(80)
West	0.9x	0.77	x	3.31	x	94.68	x	0.63	x	0.7	=	95.77	(80)
West	0.9x	0.77	x	2.16	x	73.59	x	0.63	x	0.7	=	48.58	(80)
West	0.9x	0.77	x	1.73	x	73.59	x	0.63	x	0.7	=	38.91	(80)
West	0.9x	0.77	x	1.73	x	73.59	x	0.63	x	0.7	=	38.91	(80)
West	0.9x	0.77	x	3.31	x	73.59	x	0.63	x	0.7	=	74.44	(80)
West	0.9x	0.77	x	2.16	x	45.59	x	0.63	x	0.7	=	30.09	(80)
West	0.9x	0.77	x	1.73	x	45.59	x	0.63	x	0.7	=	24.1	(80)
West	0.9x	0.77	x	1.73	x	45.59	x	0.63	x	0.7	=	24.1	(80)
West	0.9x	0.77	x	3.31	x	45.59	x	0.63	x	0.7	=	46.12	(80)
West	0.9x	0.77	x	2.16	x	24.49	x	0.63	x	0.7	=	16.17	(80)
West	0.9x	0.77	x	1.73	x	24.49	x	0.63	x	0.7	=	12.95	(80)
West	0.9x	0.77	x	1.73	x	24.49	x	0.63	x	0.7	=	12.95	(80)
West	0.9x	0.77	x	3.31	x	24.49	x	0.63	x	0.7	=	24.77	(80)
West	0.9x	0.77	x	2.16	x	16.15	x	0.63	x	0.7	=	10.66	(80)
West	0.9x	0.77	x	1.73	x	16.15	x	0.63	x	0.7	=	8.54	(80)
West	0.9x	0.77	x	1.73	x	16.15	x	0.63	x	0.7	=	8.54	(80)
West	0.9x	0.77	x	3.31	x	16.15	x	0.63	x	0.7	=	16.34	(80)

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

(83)m=	97.11	188.01	313.98	478.81	614.39	643.26	606.39	500.83	370.73	223.41	120.51	80.35	(83)

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

(84)m=	541.67	630.44	742.05	883.64	995.51	1001.58	949.92	850.52	732.37	608.51	532.6	512.79	(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	1	0.99	0.94	0.82	0.63	0.47	0.55	0.82	0.97	1	1	(86)

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

(87)m=	19.71	19.87	20.16	20.54	20.84	20.97	20.99	20.99	20.88	20.48	20.03	19.68	(87)

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

(88)m=	19.93	19.93	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.94	19.94	19.93	(88)

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

(89)m=	1	0.99	0.98	0.92	0.77	0.54	0.36	0.43	0.75	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=	18.21	18.44	18.86	19.41	19.79	19.93	19.95	19.95	19.85	19.34	18.68	18.17	(90)

fLA = Living area ÷ (4) = 0.39 (91)

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

(92)m=	18.79	18.99	19.36	19.85	20.2	20.33	20.35	20.35	20.25	19.78	19.2	18.76	(92)

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

(93)m=	18.79	18.99	19.36	19.85	20.2	20.33	20.35	20.35	20.25	19.78	19.2	18.76	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.98	0.92	0.78	0.57	0.41	0.47	0.77	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	539.54	625.1	724.43	812.97	778.18	575.22	386.16	402.99	565.24	583.61	528.35	511.24	(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=	1544.05	1498.54	1364.46	1148.46	889.08	593.83	388.84	408.5	639.74	960.81	1271.88	1536.86	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	747.36	586.95	476.19	241.55	82.51	0	0	0	0	280.64	535.34	763.06	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3713.6 (98)

Space heating requirement in kWh/m²/year 41.59 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	747.36	586.95	476.19	241.55	82.51	0	0	0	0	280.64	535.34	763.06	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	799.31	627.76	509.29	258.35	88.24	0	0	0	0	300.15	572.56	816.11	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 3971.76 (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)

TER WorkSheet: New dwelling design stage

Water heating

Output from water heater (calculated above)

203.74	179.52	188.42	168.74	165.23	147.47	141.46	155.46	155.25	174.98	185.23	198.78

Efficiency of water heater 79.8 (216)

(217)m=	87.97	87.74	87.19	85.77	83.07	79.8	79.8	79.8	79.8	86.07	87.48	88.06	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	231.59	204.6	216.11	196.73	198.91	184.8	177.27	194.81	194.55	203.3	211.73	225.73

Total = Sum(219a)$_{1...12}$ = 2440.12 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3971.76	
Water heating fuel used		2440.12	
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		374.37	(232)

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	=	857.9	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	527.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1384.97	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	194.3	(268)
Total CO2, kg/year		sum of (265)…(271) =		1618.19	(272)

TER = 26.65 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:39:04

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.4m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 009

Address : AC 009, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	30.21 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	9.41 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

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

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	4.91m²	
Windows facing: North	7.06m²	
Windows facing: North	1.97m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features	
Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 009

Address : AC 009, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.4	(1a) x	2.9	(2a) =	151.96	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	151.96	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

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

Wind Factor (22a)m = (22)m ÷ 4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

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

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

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

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

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

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

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

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.93	x	1.4	=	4.102			(26)
Windows Type 1			4.91	x1/[1/(1.4)+ 0.04]		=	6.51			(27)
Windows Type 2			7.06	x1/[1/(1.4)+ 0.04]		=	9.36			(27)
Windows Type 3			1.97	x1/[1/(1.4)+ 0.04]		=	2.61			(27)
Floor			52.4	x	0.12	=	6.288			(28)
Walls	34.68	16.87	17.81	x	0.12	=	2.14			(29)
Total area of elements, m²			87.08							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 31.01 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 9.49 (36)

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

Total fabric heat loss (33) + (36) = 40.5 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	11.33	11.22	11.11	10.58	10.47	9.94	9.94	9.84	10.15	10.47	10.69	10.9	(38)

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

(39)m=	51.83	51.72	51.62	51.08	50.98	50.44	50.44	50.34	50.66	50.98	51.19	51.4	

Average = Sum(39)$_{1…12}$ /12= 51.06 (39)

DER WorkSheet: New dwelling design stage

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

(40)m=	0.99	0.99	0.99	0.97	0.97	0.96	0.96	0.96	0.97	0.97	0.98	0.98

Average = Sum(40)$_{1...12}$ /12= 0.97 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.76 (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 76.02 (43)

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

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

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

(44)m=	83.62	80.58	77.54	74.5	71.46	68.42	68.42	71.46	74.5	77.54	80.58	83.62

Total = Sum(44)$_{1...12}$ = 912.25 (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=	124.01	108.46	111.92	97.58	93.63	80.79	74.87	85.91	86.94	101.32	110.59	120.1

Total = Sum(45)$_{1...12}$ = 1196.1 (45)

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

(46)m=	18.6	16.27	16.79	14.64	14.04	12.12	11.23	12.89	13.04	15.2	16.59	18.01	(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) = 110 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

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

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

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

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

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

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

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

(62)m=	179.29	158.39	167.2	151.07	148.9	134.29	130.14	141.19	140.43	156.59	164.09	175.37	(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)

Output from water heater

(64)m=	179.29	158.39	167.2	151.07	148.9	134.29	130.14	141.19	140.43	156.59	164.09	175.37	

Output from water heater (annual) $_{1...12}$ 1846.94 (64)

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

(65)m=	85.45	76	81.44	75.24	75.35	69.66	69.11	72.79	71.7	77.91	79.57	84.15	(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=	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	(66)

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

(67)m=	13.68	12.15	9.88	7.48	5.59	4.72	5.1	6.63	8.9	11.3	13.19	14.06	(67)

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

(68)m=	153.46	155.06	151.04	142.5	131.72	121.58	114.81	113.22	117.23	125.77	136.56	146.69	(68)

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

(69)m=	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	(71)

Water heating gains (Table 5)

(72)m=	114.86	113.1	109.46	104.5	101.28	96.75	92.9	97.83	99.58	104.72	110.51	113.11	(72)

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

(73)m=	331.42	329.72	319.79	303.89	288	272.46	262.22	267.09	275.13	291.2	309.67	323.28	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	7.06	x	10.63	x	0.4	x	0.8	=	16.65	(74)
North	0.9x	0.77	x	1.97	x	10.63	x	0.4	x	0.8	=	4.65	(74)
North	0.9x	0.77	x	7.06	x	20.32	x	0.4	x	0.8	=	31.82	(74)
North	0.9x	0.77	x	1.97	x	20.32	x	0.4	x	0.8	=	8.88	(74)
North	0.9x	0.77	x	7.06	x	34.53	x	0.4	x	0.8	=	54.06	(74)

North	0.9x	0.77	x	1.97	x	34.53	x	0.4	x	0.8	=	15.09	(74)
North	0.9x	0.77	x	7.06	x	55.46	x	0.4	x	0.8	=	86.84	(74)
North	0.9x	0.77	x	1.97	x	55.46	x	0.4	x	0.8	=	24.23	(74)
North	0.9x	0.77	x	7.06	x	74.72	x	0.4	x	0.8	=	116.98	(74)
North	0.9x	0.77	x	1.97	x	74.72	x	0.4	x	0.8	=	32.64	(74)
North	0.9x	0.77	x	7.06	x	79.99	x	0.4	x	0.8	=	125.23	(74)
North	0.9x	0.77	x	1.97	x	79.99	x	0.4	x	0.8	=	34.94	(74)
North	0.9x	0.77	x	7.06	x	74.68	x	0.4	x	0.8	=	116.92	(74)
North	0.9x	0.77	x	1.97	x	74.68	x	0.4	x	0.8	=	32.62	(74)
North	0.9x	0.77	x	7.06	x	59.25	x	0.4	x	0.8	=	92.76	(74)
North	0.9x	0.77	x	1.97	x	59.25	x	0.4	x	0.8	=	25.88	(74)
North	0.9x	0.77	x	7.06	x	41.52	x	0.4	x	0.8	=	65	(74)
North	0.9x	0.77	x	1.97	x	41.52	x	0.4	x	0.8	=	18.14	(74)
North	0.9x	0.77	x	7.06	x	24.19	x	0.4	x	0.8	=	37.87	(74)
North	0.9x	0.77	x	1.97	x	24.19	x	0.4	x	0.8	=	10.57	(74)
North	0.9x	0.77	x	7.06	x	13.12	x	0.4	x	0.8	=	20.54	(74)
North	0.9x	0.77	x	1.97	x	13.12	x	0.4	x	0.8	=	5.73	(74)
North	0.9x	0.77	x	7.06	x	8.86	x	0.4	x	0.8	=	13.88	(74)
North	0.9x	0.77	x	1.97	x	8.86	x	0.4	x	0.8	=	3.87	(74)
South	0.9x	0.77	x	4.91	x	46.75	x	0.4	x	0.8	=	50.91	(78)
South	0.9x	0.77	x	4.91	x	76.57	x	0.4	x	0.8	=	83.37	(78)
South	0.9x	0.77	x	4.91	x	97.53	x	0.4	x	0.8	=	106.2	(78)
South	0.9x	0.77	x	4.91	x	110.23	x	0.4	x	0.8	=	120.03	(78)
South	0.9x	0.77	x	4.91	x	114.87	x	0.4	x	0.8	=	125.08	(78)
South	0.9x	0.77	x	4.91	x	110.55	x	0.4	x	0.8	=	120.37	(78)
South	0.9x	0.77	x	4.91	x	108.01	x	0.4	x	0.8	=	117.61	(78)
South	0.9x	0.77	x	4.91	x	104.89	x	0.4	x	0.8	=	114.21	(78)
South	0.9x	0.77	x	4.91	x	101.89	x	0.4	x	0.8	=	110.94	(78)
South	0.9x	0.77	x	4.91	x	82.59	x	0.4	x	0.8	=	89.92	(78)
South	0.9x	0.77	x	4.91	x	55.42	x	0.4	x	0.8	=	60.34	(78)
South	0.9x	0.77	x	4.91	x	40.4	x	0.4	x	0.8	=	43.99	(78)

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

(83)m=	72.2	124.06	175.35	231.09	274.69	280.54	267.15	232.85	194.07	138.36	86.61	61.74	(83)

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

(84)m=	403.62	453.79	495.14	534.99	562.69	553	529.37	499.95	469.2	429.56	396.28	385.01	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.97	0.91	0.77	0.57	0.42	0.46	0.7	0.93	0.98	0.99	(86)

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

(87)m=	20.14	20.29	20.5	20.75	20.92	20.99	21	21	20.97	20.75	20.41	20.11	(87)

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

(88)m=	20.09	20.09	20.1	20.1	20.11	20.11	20.11	20.12	20.11	20.11	20.1	20.1	(88)

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

(89)m=	0.99	0.98	0.96	0.88	0.72	0.5	0.33	0.37	0.63	0.9	0.98	0.99	(89)

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

(90)m=	18.96	19.17	19.48	19.83	20.04	20.11	20.11	20.12	20.09	19.84	19.35	18.92	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.52	19.7	19.96	20.26	20.46	20.52	20.53	20.53	20.5	20.27	19.85	19.48	(92)

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

(93)m=	19.52	19.7	19.96	20.26	20.46	20.52	20.53	20.53	20.5	20.27	19.85	19.48	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.95	0.88	0.74	0.53	0.37	0.41	0.66	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	399.18	444.06	472.12	473.07	415.61	294.87	197.87	207.2	311.39	388.27	387.07	381.66	(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=	788.69	765.39	694.71	580.49	446.33	298.77	198.29	207.94	324.23	492.94	652.52	785.53	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	289.8	215.94	165.61	77.34	22.86	0	0	0	0	77.87	191.13	300.48	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1341.03 (98)

Space heating requirement in kWh/m²/year 25.59 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1341.03	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1475.13	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308

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Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement		1846.94	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2031.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	35.07	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		115.87	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	115.87	(331)
Energy for lighting (calculated in Appendix L)		241.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-541.49	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	570.54	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.2	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	588.74	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				588.74	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	60.14	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	125.4	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-281.03	(380)
Total CO2, kg/year	sum of (376)…(382) =				493.24	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				9.41	(384)
EI rating (section 14)					93.21	(385)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 009

Address : AC 009, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.4	(1a) x	2.9	(2a) =	151.96	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	151.96	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.32	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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

0.41	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.93	x	1.2	=	3.516			(26)
Windows Type 1			3.58	x1/[1/(1.4)+ 0.04]		=	4.75			(27)
Windows Type 2			5.15	x1/[1/(1.4)+ 0.04]		=	6.83			(27)
Windows Type 3			1.44	x1/[1/(1.4)+ 0.04]		=	1.91			(27)
Floor			52.4	x	0.13	=	6.812			(28)
Walls	34.68	13.1	21.58	x	0.18	=	3.89			(29)
Total area of elements, m²			87.08							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 27.7 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.43 (36)

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

Total fabric heat loss (33) + (36) = 34.13 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.36	29.2	29.03	28.27	28.12	27.45	27.45	27.33	27.71	28.12	28.41	28.72	(38)

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

(39)m=	63.49	63.32	63.16	62.39	62.25	61.58	61.58	61.46	61.84	62.25	62.54	62.84	

Average = Sum(39)1…12 /12= 62.39 (39)

TER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(40)m=	1.21	1.21	1.21	1.19	1.19	1.18	1.18	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 1.76 (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 76.02 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	83.62	80.58	77.54	74.5	71.46	68.42	68.42	71.46	74.5	77.54	80.58	83.62	

Total = $Sum(44)_{1...12}$ = 912.25 (44)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(45)m=	124.01	108.46	111.92	97.58	93.63	80.79	74.87	85.91	86.94	101.32	110.59	120.1	

Total = $Sum(45)_{1...12}$ = 1196.1 (45)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	18.6	16.27	16.79	14.64	14.04	12.12	11.23	12.89	13.04	15.2	16.59	18.01	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

TER WorkSheet: New dwelling design stage

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

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

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

(62)m=	170.61	150.55	158.52	142.67	140.22	125.88	121.46	132.5	132.03	147.91	155.69	166.69	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	170.61	150.55	158.52	142.67	140.22	125.88	121.46	132.5	132.03	147.91	155.69	166.69	

Output from water heater (annual)$_{1...12}$ 1744.72 (64)

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

(65)m=	78.51	69.73	74.49	68.52	68.41	62.94	62.17	65.84	64.98	70.96	72.85	77.21	(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=	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	88.04	(66)

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

(67)m=	13.68	12.15	9.88	7.48	5.59	4.72	5.1	6.63	8.9	11.3	13.19	14.06	(67)

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

(68)m=	153.46	155.06	151.04	142.5	131.72	121.58	114.81	113.22	117.23	125.77	136.56	146.69	(68)

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

(69)m=	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	(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=	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	-70.43	(71)

Water heating gains (Table 5)

(72)m=	105.52	103.77	100.12	95.16	91.94	87.41	83.56	88.5	90.25	95.38	101.17	103.77	(72)

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

(73)m=	325.08	323.39	313.46	297.56	281.67	266.13	255.88	260.76	268.79	284.87	303.33	316.94	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	5.15	x	10.63	x	0.63	x	0.7	=	16.74	(74)
North	0.9x	0.77	x	1.44	x	10.63	x	0.63	x	0.7	=	4.68	(74)
North	0.9x	0.77	x	5.15	x	20.32	x	0.63	x	0.7	=	31.98	(74)
North	0.9x	0.77	x	1.44	x	20.32	x	0.63	x	0.7	=	8.94	(74)
North	0.9x	0.77	x	5.15	x	34.53	x	0.63	x	0.7	=	54.35	(74)

North	0.9x	0.77	x	1.44	x	34.53	x	0.63	x	0.7	=	15.2	(74)
North	0.9x	0.77	x	5.15	x	55.46	x	0.63	x	0.7	=	87.3	(74)
North	0.9x	0.77	x	1.44	x	55.46	x	0.63	x	0.7	=	24.41	(74)
North	0.9x	0.77	x	5.15	x	74.72	x	0.63	x	0.7	=	117.6	(74)
North	0.9x	0.77	x	1.44	x	74.72	x	0.63	x	0.7	=	32.88	(74)
North	0.9x	0.77	x	5.15	x	79.99	x	0.63	x	0.7	=	125.89	(74)
North	0.9x	0.77	x	1.44	x	79.99	x	0.63	x	0.7	=	35.2	(74)
North	0.9x	0.77	x	5.15	x	74.68	x	0.63	x	0.7	=	117.53	(74)
North	0.9x	0.77	x	1.44	x	74.68	x	0.63	x	0.7	=	32.86	(74)
North	0.9x	0.77	x	5.15	x	59.25	x	0.63	x	0.7	=	93.25	(74)
North	0.9x	0.77	x	1.44	x	59.25	x	0.63	x	0.7	=	26.07	(74)
North	0.9x	0.77	x	5.15	x	41.52	x	0.63	x	0.7	=	65.34	(74)
North	0.9x	0.77	x	1.44	x	41.52	x	0.63	x	0.7	=	18.27	(74)
North	0.9x	0.77	x	5.15	x	24.19	x	0.63	x	0.7	=	38.07	(74)
North	0.9x	0.77	x	1.44	x	24.19	x	0.63	x	0.7	=	10.65	(74)
North	0.9x	0.77	x	5.15	x	13.12	x	0.63	x	0.7	=	20.65	(74)
North	0.9x	0.77	x	1.44	x	13.12	x	0.63	x	0.7	=	5.77	(74)
North	0.9x	0.77	x	5.15	x	8.86	x	0.63	x	0.7	=	13.95	(74)
North	0.9x	0.77	x	1.44	x	8.86	x	0.63	x	0.7	=	3.9	(74)
South	0.9x	0.77	x	3.58	x	46.75	x	0.63	x	0.7	=	51.15	(78)
South	0.9x	0.77	x	3.58	x	76.57	x	0.63	x	0.7	=	83.77	(78)
South	0.9x	0.77	x	3.58	x	97.53	x	0.63	x	0.7	=	106.71	(78)
South	0.9x	0.77	x	3.58	x	110.23	x	0.63	x	0.7	=	120.61	(78)
South	0.9x	0.77	x	3.58	x	114.87	x	0.63	x	0.7	=	125.68	(78)
South	0.9x	0.77	x	3.58	x	110.55	x	0.63	x	0.7	=	120.95	(78)
South	0.9x	0.77	x	3.58	x	108.01	x	0.63	x	0.7	=	118.18	(78)
South	0.9x	0.77	x	3.58	x	104.89	x	0.63	x	0.7	=	114.76	(78)
South	0.9x	0.77	x	3.58	x	101.89	x	0.63	x	0.7	=	111.47	(78)
South	0.9x	0.77	x	3.58	x	82.59	x	0.63	x	0.7	=	90.36	(78)
South	0.9x	0.77	x	3.58	x	55.42	x	0.63	x	0.7	=	60.63	(78)
South	0.9x	0.77	x	3.58	x	40.4	x	0.63	x	0.7	=	44.2	(78)

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

(83)m=	72.57	124.7	176.25	232.31	276.16	282.04	268.57	234.09	195.09	139.07	87.05	62.05	(83)

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

(84)m=	397.65	448.09	489.71	529.87	557.82	548.17	524.46	494.84	463.88	423.94	390.38	378.99	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.98	0.94	0.85	0.67	0.51	0.56	0.79	0.95	0.99	1	(86)

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

(87)m=	19.82	19.98	20.22	20.54	20.81	20.95	20.99	20.99	20.9	20.57	20.14	19.79	(87)

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

(88)m=	19.91	19.91	19.92	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.93	19.92	(88)

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

(89)m=	0.99	0.99	0.97	0.92	0.79	0.58	0.39	0.44	0.71	0.93	0.98	0.99	(89)

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

(90)m=	18.36	18.59	18.95	19.4	19.75	19.91	19.94	19.94	19.86	19.45	18.84	18.33	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.05	19.25	19.55	19.94	20.25	20.4	20.43	20.43	20.35	19.97	19.45	19.02	(92)

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

(93)m=	19.05	19.25	19.55	19.94	20.25	20.4	20.43	20.43	20.35	19.97	19.45	19.02	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.97	0.92	0.81	0.62	0.45	0.49	0.75	0.93	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	393.94	440.49	472.92	486.76	451.98	341.05	233.54	243.64	346.66	395.34	383.34	376.14	(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=	936.5	908.38	824.17	688.83	532.11	357.37	236.08	247.74	386.33	583.52	772.48	931.39	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	403.67	314.42	261.33	145.49	59.62	0	0	0	0	140	280.17	413.11	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2017.82 (98)

Space heating requirement in kWh/m²/year 38.51 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	403.67	314.42	261.33	145.49	59.62	0	0	0	0	140	280.17	413.11	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	431.73	336.28	279.5	155.61	63.77	0	0	0	0	149.74	299.65	441.83	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2158.1 (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)

TER WorkSheet: New dwelling design stage

Water heating

Output from water heater (calculated above)

170.61	150.55	158.52	142.67	140.22	125.88	121.46	132.5	132.03	147.91	155.69	166.69

Efficiency of water heater 79.8 (216)

(217)m=	87.03	86.73	86.14	84.87	82.72	79.8	79.8	79.8	79.8	84.67	86.36	87.14	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	196.02	173.57	184.02	168.11	169.52	157.75	152.21	166.05	165.45	174.69	180.27	191.29

Total = Sum(219a)$_{1...12}$ = 2078.94 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2158.1	
Water heating fuel used			2078.94	
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			241.62	(232)

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	=	466.15	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	449.05	(264)
Space and water heating	(261) + (262) + (263) + (264) =			915.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	125.4	(268)
Total CO2, kg/year		sum of (265)…(271) =		1079.53	(272)

TER = 30.21 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:39:16

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.1m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 010

Address : AC 010, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	26.84 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	7.56 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	48.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	2.69m²	
Windows facing: South	4.91m²	
Windows facing: North	7.06m²	
Windows facing: North	2.69m²	
Windows facing: North	2.01m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.12 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 010

Address : AC 010, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.1	(1a) x	2.9	(2a) =	226.49	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	226.49	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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

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

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

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

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

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

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

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.93	x	1.4	=	4.102			(26)
Windows Type 1			2.69	x1/[1/(1.4)+ 0.04]		=	3.57			(27)
Windows Type 2			4.91	x1/[1/(1.4)+ 0.04]		=	6.51			(27)
Windows Type 3			7.06	x1/[1/(1.4)+ 0.04]		=	9.36			(27)
Windows Type 4			2.69	x1/[1/(1.4)+ 0.04]		=	3.57			(27)
Windows Type 5			2.01	x1/[1/(1.4)+ 0.04]		=	2.66			(27)
Floor			78.1	x	0.12	=	9.372			(28)
Walls	51.79	22.29	29.5	x	0.12	=	3.54			(29)
Total area of elements, m²			129.89							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 42.68 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 12.18 (36)

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

Total fabric heat loss (33) + (36) = 54.86 (37)

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

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

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(38)m=	16.88	16.72	16.56	15.77	15.61	14.82	14.82	14.66	15.14	15.61	15.93	16.25	(38)

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

(39)m=	71.74	71.58	71.42	70.63	70.47	69.68	69.68	69.52	69.99	70.47	70.79	71.11	

Average = Sum(39)$_{1...12}$ /12= 70.59 (39)

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

(40)m=	0.92	0.92	0.91	0.9	0.9	0.89	0.89	0.89	0.9	0.9	0.91	0.91	

Average = Sum(40)$_{1...12}$ /12= 0.9 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.43 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.81 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	100.99	97.32	93.65	89.98	86.3	82.63	82.63	86.3	89.98	93.65	97.32	100.99	

Total = Sum(44)$_{1...12}$ = 1101.76 (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=	149.77	130.99	135.17	117.85	113.08	97.58	90.42	103.76	105	122.36	133.57	145.05	

Total = Sum(45)$_{1...12}$ = 1444.58 (45)

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

(46)m=	22.47	19.65	20.28	17.68	16.96	14.64	13.56	15.56	15.75	18.35	20.04	21.76	(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) = 110 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

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

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

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

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

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

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

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

(62)m=	205.05	180.92	190.45	171.34	168.35	151.07	145.7	159.03	158.49	177.64	187.06	200.32	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	205.05	180.92	190.45	171.34	168.35	151.07	145.7	159.03	158.49	177.64	187.06	200.32	

Output from water heater (annual)$_{1...12}$ | 2095.42 | (64)

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

(65)m=	94.02	83.5	89.17	81.98	81.82	75.24	74.29	78.72	77.71	84.91	87.21	92.45	(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=	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	(66)

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

(67)m=	19.21	17.06	13.87	10.5	7.85	6.63	7.16	9.31	12.49	15.86	18.52	19.74	(67)

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

(68)m=	215.42	217.66	212.03	200.03	184.9	170.67	161.16	158.93	164.56	176.55	191.69	205.92	(68)

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

(69)m=	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	(71)

Water heating gains (Table 5)

(72)m=	126.37	124.25	119.85	113.86	109.97	104.5	99.85	105.81	107.92	114.12	121.12	124.26	(72)

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

(73)m=	420.39	418.36	405.13	383.78	362.11	341.18	327.56	333.43	344.37	365.93	390.71	409.3	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	7.06	x	10.63	x	0.4	x	0.8	=	16.65	(74)
North	0.9x	0.77	x	2.69	x	10.63	x	0.4	x	0.8	=	6.34	(74)

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North	0.9x	0.77	x	2.01	x	10.63	x	0.4	x	0.8	=	4.74	(74)
North	0.9x	0.77	x	7.06	x	20.32	x	0.4	x	0.8	=	31.82	(74)
North	0.9x	0.77	x	2.69	x	20.32	x	0.4	x	0.8	=	12.12	(74)
North	0.9x	0.77	x	2.01	x	20.32	x	0.4	x	0.8	=	9.06	(74)
North	0.9x	0.77	x	7.06	x	34.53	x	0.4	x	0.8	=	54.06	(74)
North	0.9x	0.77	x	2.69	x	34.53	x	0.4	x	0.8	=	20.6	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.4	x	0.8	=	15.39	(74)
North	0.9x	0.77	x	7.06	x	55.46	x	0.4	x	0.8	=	86.84	(74)
North	0.9x	0.77	x	2.69	x	55.46	x	0.4	x	0.8	=	33.09	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.4	x	0.8	=	24.72	(74)
North	0.9x	0.77	x	7.06	x	74.72	x	0.4	x	0.8	=	116.98	(74)
North	0.9x	0.77	x	2.69	x	74.72	x	0.4	x	0.8	=	44.57	(74)
North	0.9x	0.77	x	2.01	x	74.72	x	0.4	x	0.8	=	33.3	(74)
North	0.9x	0.77	x	7.06	x	79.99	x	0.4	x	0.8	=	125.23	(74)
North	0.9x	0.77	x	2.69	x	79.99	x	0.4	x	0.8	=	47.71	(74)
North	0.9x	0.77	x	2.01	x	79.99	x	0.4	x	0.8	=	35.65	(74)
North	0.9x	0.77	x	7.06	x	74.68	x	0.4	x	0.8	=	116.92	(74)
North	0.9x	0.77	x	2.69	x	74.68	x	0.4	x	0.8	=	44.55	(74)
North	0.9x	0.77	x	2.01	x	74.68	x	0.4	x	0.8	=	33.29	(74)
North	0.9x	0.77	x	7.06	x	59.25	x	0.4	x	0.8	=	92.76	(74)
North	0.9x	0.77	x	2.69	x	59.25	x	0.4	x	0.8	=	35.34	(74)
North	0.9x	0.77	x	2.01	x	59.25	x	0.4	x	0.8	=	26.41	(74)
North	0.9x	0.77	x	7.06	x	41.52	x	0.4	x	0.8	=	65	(74)
North	0.9x	0.77	x	2.69	x	41.52	x	0.4	x	0.8	=	24.77	(74)
North	0.9x	0.77	x	2.01	x	41.52	x	0.4	x	0.8	=	18.51	(74)
North	0.9x	0.77	x	7.06	x	24.19	x	0.4	x	0.8	=	37.87	(74)
North	0.9x	0.77	x	2.69	x	24.19	x	0.4	x	0.8	=	14.43	(74)
North	0.9x	0.77	x	2.01	x	24.19	x	0.4	x	0.8	=	10.78	(74)
North	0.9x	0.77	x	7.06	x	13.12	x	0.4	x	0.8	=	20.54	(74)
North	0.9x	0.77	x	2.69	x	13.12	x	0.4	x	0.8	=	7.83	(74)
North	0.9x	0.77	x	2.01	x	13.12	x	0.4	x	0.8	=	5.85	(74)
North	0.9x	0.77	x	7.06	x	8.86	x	0.4	x	0.8	=	13.88	(74)
North	0.9x	0.77	x	2.69	x	8.86	x	0.4	x	0.8	=	5.29	(74)
North	0.9x	0.77	x	2.01	x	8.86	x	0.4	x	0.8	=	3.95	(74)
South	0.9x	0.77	x	2.69	x	46.75	x	0.4	x	0.8	=	27.89	(78)
South	0.9x	0.77	x	4.91	x	46.75	x	0.4	x	0.8	=	50.91	(78)
South	0.9x	0.77	x	2.69	x	76.57	x	0.4	x	0.8	=	45.68	(78)
South	0.9x	0.77	x	4.91	x	76.57	x	0.4	x	0.8	=	83.37	(78)
South	0.9x	0.77	x	2.69	x	97.53	x	0.4	x	0.8	=	58.18	(78)
South	0.9x	0.77	x	4.91	x	97.53	x	0.4	x	0.8	=	106.2	(78)
South	0.9x	0.77	x	2.69	x	110.23	x	0.4	x	0.8	=	65.76	(78)

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South	0.9x	0.77	x	4.91	x	110.23	x	0.4	x	0.8	=	120.03	(78)
South	0.9x	0.77	x	2.69	x	114.87	x	0.4	x	0.8	=	68.52	(78)
South	0.9x	0.77	x	4.91	x	114.87	x	0.4	x	0.8	=	125.08	(78)
South	0.9x	0.77	x	2.69	x	110.55	x	0.4	x	0.8	=	65.95	(78)
South	0.9x	0.77	x	4.91	x	110.55	x	0.4	x	0.8	=	120.37	(78)
South	0.9x	0.77	x	2.69	x	108.01	x	0.4	x	0.8	=	64.43	(78)
South	0.9x	0.77	x	4.91	x	108.01	x	0.4	x	0.8	=	117.61	(78)
South	0.9x	0.77	x	2.69	x	104.89	x	0.4	x	0.8	=	62.57	(78)
South	0.9x	0.77	x	4.91	x	104.89	x	0.4	x	0.8	=	114.21	(78)
South	0.9x	0.77	x	2.69	x	101.89	x	0.4	x	0.8	=	60.78	(78)
South	0.9x	0.77	x	4.91	x	101.89	x	0.4	x	0.8	=	110.94	(78)
South	0.9x	0.77	x	2.69	x	82.59	x	0.4	x	0.8	=	49.27	(78)
South	0.9x	0.77	x	4.91	x	82.59	x	0.4	x	0.8	=	89.92	(78)
South	0.9x	0.77	x	2.69	x	55.42	x	0.4	x	0.8	=	33.06	(78)
South	0.9x	0.77	x	4.91	x	55.42	x	0.4	x	0.8	=	60.34	(78)
South	0.9x	0.77	x	2.69	x	40.4	x	0.4	x	0.8	=	24.1	(78)
South	0.9x	0.77	x	4.91	x	40.4	x	0.4	x	0.8	=	43.99	(78)

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

(83)m=	106.53	182.04	254.43	330.43	388.45	394.91	376.79	331.3	279.99	202.27	127.61	91.2	(83)

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

(84)m=	526.91	600.4	659.57	714.21	750.56	736.09	704.35	664.73	624.35	568.2	518.32	500.51	(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	0.92	0.8	0.59	0.43	0.48	0.73	0.94	0.99	1	(86)

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

(87)m=	20.15	20.3	20.51	20.75	20.93	20.99	21	21	20.97	20.75	20.41	20.13	(87)

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

(88)m=	20.15	20.15	20.16	20.16	20.17	20.17	20.17	20.18	20.17	20.17	20.16	20.16	(88)

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

(89)m=	0.99	0.99	0.97	0.9	0.75	0.52	0.35	0.39	0.66	0.92	0.99	1	(89)

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

(90)m=	19.02	19.24	19.54	19.88	20.1	20.17	20.17	20.17	20.15	19.89	19.4	18.99	(90)

fLA = Living area ÷ (4) = 0.35 (91)

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

(92)m=	19.43	19.61	19.88	20.19	20.39	20.46	20.47	20.47	20.44	20.19	19.76	19.39	(92)

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

(93)m=	19.43	19.61	19.88	20.19	20.39	20.46	20.47	20.47	20.44	20.19	19.76	19.39	(93)

8. Space heating requirement

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

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

Utilisation factor for gains, hm:

(94)m=	0.99	0.99	0.96	0.9	0.76	0.55	0.38	0.42	0.68	0.92	0.98	1	(94)

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

(95)m=	523.44	591.62	636.28	644.43	570.14	403.44	268.96	281.9	426.46	524.26	510.44	498.01	(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=	1085.11	1053.19	955.63	797.61	612.47	408.25	269.39	282.71	443.54	676.14	896.03	1080.15	(97)

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

(98)m=	417.88	310.18	237.59	110.29	31.49	0	0	0	0	113	277.62	433.11

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1931.16 (98)

Space heating requirement in kWh/m²/year 24.73 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1931.16	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2124.28	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		2095.42	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2304.96	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	44.29	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		172.7	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	172.7	(331)

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Energy for lighting (calculated in Appendix L)			339.17	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-807.48	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)			0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	720.62	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	22.99	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	743.61	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				743.61	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	89.63	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	176.03	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-419.08	(380)
Total CO2, kg/year	sum of (376)…(382) =				590.18	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				7.56	(384)
EI rating (section 14)					93.58	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 010

Address : AC 010, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.1	(1a) x	2.9	(2a) =	226.49	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.1	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		226.49	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.33	(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

0.41	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

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

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.93	x	1.2	=	3.516			(26)
Windows Type 1			2.31	x1/[1/(1.4)+ 0.04]		=	3.06			(27)
Windows Type 2			4.21	x1/[1/(1.4)+ 0.04]		=	5.58			(27)
Windows Type 3			6.05	x1/[1/(1.4)+ 0.04]		=	8.02			(27)
Windows Type 4			2.31	x1/[1/(1.4)+ 0.04]		=	3.06			(27)
Windows Type 5			1.72	x1/[1/(1.4)+ 0.04]		=	2.28			(27)
Floor			78.1	x	0.13	=	10.153			(28)
Walls	51.79	19.53	32.26	x	0.18	=	5.81			(29)
Total area of elements, m²			129.89							(31)
Party wall			49.76	x	0	=	0			(32)

** 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) = 41.48 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 8.46 (36)

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

Total fabric heat loss (33) + (36) = 49.94 (37)

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

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	43.79	43.54	43.3	42.15	41.93	40.94	40.94	40.75	41.32	41.93	42.37	42.82		(38)

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

(39)m=	93.73	93.48	93.24	92.09	91.88	90.88	90.88	90.69	91.26	91.88	92.31	92.77		
										Average = Sum(39)1…12 /12=			92.09	(39)

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

(40)m=	1.2	1.2	1.19	1.18	1.18	1.16	1.16	1.16	1.17	1.18	1.18	1.19		
										Average = Sum(40)1…12 /12=			1.18	(40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.43 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.81 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)														
(44)m=	100.99	97.32	93.65	89.98	86.3	82.63	82.63	86.3	89.98	93.65	97.32	100.99		
										Total = Sum(44)1…12 =			1101.76	(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=	149.77	130.99	135.17	117.85	113.08	97.58	90.42	103.76	105	122.36	133.57	145.05		
										Total = Sum(45)1…12 =			1444.58	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)														
(46)m=	22.47	19.65	20.28	17.68	16.96	14.64	13.56	15.56	15.75	18.35	20.04	21.76		(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

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

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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

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

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

(62)m=	196.37	173.08	181.77	162.94	159.67	142.67	137.01	150.35	150.09	168.96	178.66	191.64	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	196.37	173.08	181.77	162.94	159.67	142.67	137.01	150.35	150.09	168.96	178.66	191.64	

Output from water heater (annual)$_{1...12}$ 1993.2 (64)

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

(65)m=	87.08	77.22	82.22	75.26	74.87	68.52	67.34	71.77	70.98	77.96	80.48	85.5	(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=	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	121.29	(66)

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

(67)m=	19.21	17.06	13.87	10.5	7.85	6.63	7.16	9.31	12.49	15.86	18.52	19.74	(67)

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

(68)m=	215.42	217.66	212.03	200.03	184.9	170.67	161.16	158.93	164.56	176.55	191.69	205.92	(68)

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

(69)m=	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	35.13	(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=	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	-97.03	(71)

Water heating gains (Table 5)

(72)m=	117.04	114.92	110.51	104.52	100.64	95.16	90.51	96.47	98.59	104.79	111.78	114.92	(72)

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

(73)m=	414.05	412.02	398.8	377.45	355.77	334.85	321.22	327.09	338.03	359.59	384.38	402.97	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	6.05	x	10.63	x	0.63	x	0.7	=	19.66	(74)
North	0.9x	0.77	x	2.31	x	10.63	x	0.63	x	0.7	=	7.51	(74)

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North	0.9x	0.77	x	1.72	x	10.63	x	0.63	x	0.7	=	5.59	(74)
North	0.9x	0.77	x	6.05	x	20.32	x	0.63	x	0.7	=	37.57	(74)
North	0.9x	0.77	x	2.31	x	20.32	x	0.63	x	0.7	=	14.35	(74)
North	0.9x	0.77	x	1.72	x	20.32	x	0.63	x	0.7	=	10.68	(74)
North	0.9x	0.77	x	6.05	x	34.53	x	0.63	x	0.7	=	63.85	(74)
North	0.9x	0.77	x	2.31	x	34.53	x	0.63	x	0.7	=	24.38	(74)
North	0.9x	0.77	x	1.72	x	34.53	x	0.63	x	0.7	=	18.15	(74)
North	0.9x	0.77	x	6.05	x	55.46	x	0.63	x	0.7	=	102.55	(74)
North	0.9x	0.77	x	2.31	x	55.46	x	0.63	x	0.7	=	39.16	(74)
North	0.9x	0.77	x	1.72	x	55.46	x	0.63	x	0.7	=	29.16	(74)
North	0.9x	0.77	x	6.05	x	74.72	x	0.63	x	0.7	=	138.15	(74)
North	0.9x	0.77	x	2.31	x	74.72	x	0.63	x	0.7	=	52.75	(74)
North	0.9x	0.77	x	1.72	x	74.72	x	0.63	x	0.7	=	39.27	(74)
North	0.9x	0.77	x	6.05	x	79.99	x	0.63	x	0.7	=	147.89	(74)
North	0.9x	0.77	x	2.31	x	79.99	x	0.63	x	0.7	=	56.47	(74)
North	0.9x	0.77	x	1.72	x	79.99	x	0.63	x	0.7	=	42.04	(74)
North	0.9x	0.77	x	6.05	x	74.68	x	0.63	x	0.7	=	138.07	(74)
North	0.9x	0.77	x	2.31	x	74.68	x	0.63	x	0.7	=	52.72	(74)
North	0.9x	0.77	x	1.72	x	74.68	x	0.63	x	0.7	=	39.25	(74)
North	0.9x	0.77	x	6.05	x	59.25	x	0.63	x	0.7	=	109.54	(74)
North	0.9x	0.77	x	2.31	x	59.25	x	0.63	x	0.7	=	41.83	(74)
North	0.9x	0.77	x	1.72	x	59.25	x	0.63	x	0.7	=	31.14	(74)
North	0.9x	0.77	x	6.05	x	41.52	x	0.63	x	0.7	=	76.76	(74)
North	0.9x	0.77	x	2.31	x	41.52	x	0.63	x	0.7	=	29.31	(74)
North	0.9x	0.77	x	1.72	x	41.52	x	0.63	x	0.7	=	21.82	(74)
North	0.9x	0.77	x	6.05	x	24.19	x	0.63	x	0.7	=	44.73	(74)
North	0.9x	0.77	x	2.31	x	24.19	x	0.63	x	0.7	=	17.08	(74)
North	0.9x	0.77	x	1.72	x	24.19	x	0.63	x	0.7	=	12.72	(74)
North	0.9x	0.77	x	6.05	x	13.12	x	0.63	x	0.7	=	24.25	(74)
North	0.9x	0.77	x	2.31	x	13.12	x	0.63	x	0.7	=	9.26	(74)
North	0.9x	0.77	x	1.72	x	13.12	x	0.63	x	0.7	=	6.9	(74)
North	0.9x	0.77	x	6.05	x	8.86	x	0.63	x	0.7	=	16.39	(74)
North	0.9x	0.77	x	2.31	x	8.86	x	0.63	x	0.7	=	6.26	(74)
North	0.9x	0.77	x	1.72	x	8.86	x	0.63	x	0.7	=	4.66	(74)
South	0.9x	0.77	x	2.31	x	46.75	x	0.63	x	0.7	=	33.01	(78)
South	0.9x	0.77	x	4.21	x	46.75	x	0.63	x	0.7	=	60.15	(78)
South	0.9x	0.77	x	2.31	x	76.57	x	0.63	x	0.7	=	54.05	(78)
South	0.9x	0.77	x	4.21	x	76.57	x	0.63	x	0.7	=	98.51	(78)
South	0.9x	0.77	x	2.31	x	97.53	x	0.63	x	0.7	=	68.86	(78)
South	0.9x	0.77	x	4.21	x	97.53	x	0.63	x	0.7	=	125.49	(78)
South	0.9x	0.77	x	2.31	x	110.23	x	0.63	x	0.7	=	77.82	(78)

South	0.9x	0.77	x	4.21	x	110.23	x	0.63	x	0.7	=	141.83	(78)
South	0.9x	0.77	x	2.31	x	114.87	x	0.63	x	0.7	=	81.1	(78)
South	0.9x	0.77	x	4.21	x	114.87	x	0.63	x	0.7	=	147.8	(78)
South	0.9x	0.77	x	2.31	x	110.55	x	0.63	x	0.7	=	78.04	(78)
South	0.9x	0.77	x	4.21	x	110.55	x	0.63	x	0.7	=	142.23	(78)
South	0.9x	0.77	x	2.31	x	108.01	x	0.63	x	0.7	=	76.25	(78)
South	0.9x	0.77	x	4.21	x	108.01	x	0.63	x	0.7	=	138.97	(78)
South	0.9x	0.77	x	2.31	x	104.89	x	0.63	x	0.7	=	74.05	(78)
South	0.9x	0.77	x	4.21	x	104.89	x	0.63	x	0.7	=	134.96	(78)
South	0.9x	0.77	x	2.31	x	101.89	x	0.63	x	0.7	=	71.93	(78)
South	0.9x	0.77	x	4.21	x	101.89	x	0.63	x	0.7	=	131.09	(78)
South	0.9x	0.77	x	2.31	x	82.59	x	0.63	x	0.7	=	58.3	(78)
South	0.9x	0.77	x	4.21	x	82.59	x	0.63	x	0.7	=	106.26	(78)
South	0.9x	0.77	x	2.31	x	55.42	x	0.63	x	0.7	=	39.12	(78)
South	0.9x	0.77	x	4.21	x	55.42	x	0.63	x	0.7	=	71.3	(78)
South	0.9x	0.77	x	2.31	x	40.4	x	0.63	x	0.7	=	28.52	(78)
South	0.9x	0.77	x	4.21	x	40.4	x	0.63	x	0.7	=	51.98	(78)

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

(83)m=	125.92	215.17	300.72	390.52	459.06	466.68	445.27	391.53	330.91	239.08	150.83	107.8	(83)

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

(84)m=	539.97	627.19	699.52	767.96	814.83	801.52	766.49	718.62	668.94	598.67	535.21	510.77	(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	0.94	0.85	0.68	0.51	0.56	0.81	0.96	0.99	1	(86)

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

(87)m=	19.78	19.95	20.21	20.53	20.81	20.95	20.99	20.99	20.89	20.54	20.1	19.75	(87)

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

(88)m=	19.92	19.92	19.92	19.94	19.94	19.95	19.95	19.95	19.95	19.94	19.93	19.93	(88)

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

(89)m=	1	0.99	0.97	0.92	0.8	0.59	0.39	0.44	0.73	0.94	0.99	1	(89)

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

(90)m=	18.3	18.55	18.93	19.4	19.75	19.92	19.95	19.95	19.86	19.42	18.79	18.27	(90)

fLA = Living area ÷ (4) = 0.35 (91)

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

(92)m=	18.82	19.05	19.38	19.8	20.13	20.29	20.32	20.31	20.23	19.82	19.25	18.79	(92)

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

(93)m=	18.82	19.05	19.38	19.8	20.13	20.29	20.32	20.31	20.23	19.82	19.25	18.79	(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

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Utilisation factor for gains, hm:

(94)m=	0.99	0.99	0.97	0.92	0.81	0.62	0.44	0.49	0.75	0.94	0.99	0.99	(94)

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

(95)m=	536.3	618.35	677.69	707.36	659.7	494.54	334.53	349.58	501.75	562.41	527.76	508.08	(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=	1361.47	1322.57	1200.99	1003.99	774.29	516.81	337.75	355	559.18	847.21	1121.84	1353.66	(97)

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

(98)m=	613.92	473.24	389.33	213.57	85.26	0	0	0	0	211.89	427.73	629.11

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3044.06 (98)

Space heating requirement in kWh/m²/year 38.98 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	613.92	473.24	389.33	213.57	85.26	0	0	0	0	211.89	427.73	629.11		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	656.6	506.14	416.4	228.42	91.18	0	0	0	0	226.62	457.47	672.85		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													3255.68	(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)	196.37	173.08	181.77	162.94	159.67	142.67	137.01	150.35	150.09	168.96	178.66	191.64		
Efficiency of water heater													79.8	(216)
(217)m=	87.65	87.36	86.8	85.54	83.23	79.8	79.8	79.8	79.8	85.42	87.06	87.75		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	224.03	198.11	209.42	190.49	191.85	178.78	171.7	188.41	188.08	197.8	205.21	218.39		
Total = Sum(219a)$_{1...12}$ =													2362.27	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		3255.68
Water heating fuel used		2362.27
Electricity for pumps, fans and electric keep-hot		

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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		339.17	(232)

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	=	703.23	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	510.25	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1213.48	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	176.03	(268)
Total CO2, kg/year		sum of (265)…(271) =		1428.43	(272)

TER = 26.84 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:39:25

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 95.2m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 011

Address : AC 011, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	27.36 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	8.66 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	57.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	3.44m²	
Windows facing: East	3.44m²	
Windows facing: East	5.36m²	
Windows facing: East	3.44m²	
Windows facing: North	3.44m²	
Windows facing: North	2.83m²	
Windows facing: North	2.75m²	
Windows facing: North	2.69m²	
Windows facing: North	1.8m²	
Windows facing: South	1.8m²	
Windows facing: South	4.91m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.12 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 011

Address : AC 011, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	95.2	(1a) x	2.9	(2a) =	276.08	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	95.2	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	276.08	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction *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*		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		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

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

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.09	(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

0.12	0.12	0.11	0.1	0.1	0.09	0.09	0.09	0.09	0.1	0.1	0.11

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	(24a)

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

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

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

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

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

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

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

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			3.89	x	1.4	=	5.446			(26)
Windows Type 1			3.44	x1/[1/(1.4)+ 0.04]		=	4.56			(27)
Windows Type 2			3.44	x1/[1/(1.4)+ 0.04]		=	4.56			(27)
Windows Type 3			5.36	x1/[1/(1.4)+ 0.04]		=	7.11			(27)
Windows Type 4			3.44	x1/[1/(1.4)+ 0.04]		=	4.56			(27)
Windows Type 5			3.44	x1/[1/(1.4)+ 0.04]		=	4.56			(27)
Windows Type 6			2.83	x1/[1/(1.4)+ 0.04]		=	3.75			(27)
Windows Type 7			2.75	x1/[1/(1.4)+ 0.04]		=	3.65			(27)
Windows Type 8			2.69	x1/[1/(1.4)+ 0.04]		=	3.57			(27)
Windows Type 9			1.8	x1/[1/(1.4)+ 0.04]		=	2.39			(27)
Windows Type 10			1.8	x1/[1/(1.4)+ 0.04]		=	2.39			(27)
Windows Type 11			4.91	x1/[1/(1.4)+ 0.04]		=	6.51			(27)
Floor			95.2	x	0.12	=	11.424			(28)
Walls	88.28	39.79	48.49	x	0.12	=	5.82			(29)
Total area of elements, m²			183.48							(31)
Party wall			24.88	x	0	=	0			(32)

** 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) = 70.28 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 | 18.17 | (36)

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

Total fabric heat loss (33) + (36) = | 88.45 | (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	21.45	21.24	21.03	19.98	19.76	18.71	18.71	18.5	19.13	19.76	20.19	20.61	(38)

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

(39)m=	109.9	109.69	109.48	108.43	108.22	107.16	107.16	106.95	107.59	108.22	108.64	109.06	

Average = Sum(39)$_{1…12}$ /12= | 108.38 | (39)

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

(40)m=	1.15	1.15	1.15	1.14	1.14	1.13	1.13	1.12	1.13	1.14	1.14	1.15	

Average = Sum(40)$_{1…12}$ /12= | 1.14 | (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N | 2.69 | (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 | 98.1 | (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	107.91	103.98	100.06	96.14	92.21	88.29	88.29	92.21	96.14	100.06	103.98	107.91	

Total = Sum(44)$_{1…12}$ = | 1177.17 | (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=	160.02	139.96	144.42	125.91	120.82	104.25	96.61	110.86	112.18	130.74	142.71	154.97	

Total = Sum(45)$_{1…12}$ = | 1543.46 | (45)

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

(46)m=	24	20.99	21.66	18.89	18.12	15.64	14.49	16.63	16.83	19.61	21.41	23.25	(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) = | 110 | (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) | 0.02 | (51)

If community heating see section 4.3

Volume factor from Table 2a | 1.03 | (52)

Temperature factor from Table 2b | 0.6 | (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.03	(54)
Enter (50) or (54) in (55)		1.03	(55)

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

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

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

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

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

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

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

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

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

(62)m=	215.3	189.89	199.7	179.41	176.09	157.75	151.88	166.14	165.68	186.01	196.2	210.25	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	215.3	189.89	199.7	179.41	176.09	157.75	151.88	166.14	165.68	186.01	196.2	210.25	

Output from water heater (annual)1…12 | 2194.3 | (64)

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

(65)m=	97.43	86.48	92.24	84.66	84.39	77.46	76.34	81.08	80.1	87.69	90.25	95.75	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	(66)

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

(67)m=	22.14	19.66	15.99	12.11	9.05	7.64	8.26	10.73	14.4	18.29	21.34	22.75	(67)

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

(68)m=	248.33	250.9	244.41	230.59	213.14	196.73	185.78	183.2	189.69	203.52	220.97	237.37	(68)

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

(69)m=	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	(71)

Water heating gains (Table 5)

(72)m=	130.95	128.69	123.98	117.58	113.43	107.58	102.61	108.98	111.24	117.87	125.34	128.7	(72)

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

(73)m=	464.77	462.61	447.74	423.63	398.97	375.31	360	366.27	378.7	403.03	431.01	452.18	(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	3.44	x	10.63	x	0.4	x	0.8	=	8.11	(74)
North	0.9x	0.77	x	2.83	x	10.63	x	0.4	x	0.8	=	6.67	(74)
North	0.9x	0.77	x	2.75	x	10.63	x	0.4	x	0.8	=	6.48	(74)
North	0.9x	0.77	x	2.69	x	10.63	x	0.4	x	0.8	=	6.34	(74)
North	0.9x	0.77	x	1.8	x	10.63	x	0.4	x	0.8	=	4.24	(74)
North	0.9x	0.77	x	3.44	x	20.32	x	0.4	x	0.8	=	15.5	(74)
North	0.9x	0.77	x	2.83	x	20.32	x	0.4	x	0.8	=	12.75	(74)
North	0.9x	0.77	x	2.75	x	20.32	x	0.4	x	0.8	=	12.39	(74)
North	0.9x	0.77	x	2.69	x	20.32	x	0.4	x	0.8	=	12.12	(74)
North	0.9x	0.77	x	1.8	x	20.32	x	0.4	x	0.8	=	8.11	(74)
North	0.9x	0.77	x	3.44	x	34.53	x	0.4	x	0.8	=	26.34	(74)
North	0.9x	0.77	x	2.83	x	34.53	x	0.4	x	0.8	=	21.67	(74)
North	0.9x	0.77	x	2.75	x	34.53	x	0.4	x	0.8	=	21.06	(74)
North	0.9x	0.77	x	2.69	x	34.53	x	0.4	x	0.8	=	20.6	(74)
North	0.9x	0.77	x	1.8	x	34.53	x	0.4	x	0.8	=	13.78	(74)
North	0.9x	0.77	x	3.44	x	55.46	x	0.4	x	0.8	=	42.31	(74)
North	0.9x	0.77	x	2.83	x	55.46	x	0.4	x	0.8	=	34.81	(74)
North	0.9x	0.77	x	2.75	x	55.46	x	0.4	x	0.8	=	33.82	(74)
North	0.9x	0.77	x	2.69	x	55.46	x	0.4	x	0.8	=	33.09	(74)
North	0.9x	0.77	x	1.8	x	55.46	x	0.4	x	0.8	=	22.14	(74)
North	0.9x	0.77	x	3.44	x	74.72	x	0.4	x	0.8	=	57	(74)
North	0.9x	0.77	x	2.83	x	74.72	x	0.4	x	0.8	=	46.89	(74)
North	0.9x	0.77	x	2.75	x	74.72	x	0.4	x	0.8	=	45.56	(74)
North	0.9x	0.77	x	2.69	x	74.72	x	0.4	x	0.8	=	44.57	(74)
North	0.9x	0.77	x	1.8	x	74.72	x	0.4	x	0.8	=	29.82	(74)
North	0.9x	0.77	x	3.44	x	79.99	x	0.4	x	0.8	=	61.02	(74)
North	0.9x	0.77	x	2.83	x	79.99	x	0.4	x	0.8	=	50.2	(74)
North	0.9x	0.77	x	2.75	x	79.99	x	0.4	x	0.8	=	48.78	(74)
North	0.9x	0.77	x	2.69	x	79.99	x	0.4	x	0.8	=	47.71	(74)
North	0.9x	0.77	x	1.8	x	79.99	x	0.4	x	0.8	=	31.93	(74)
North	0.9x	0.77	x	3.44	x	74.68	x	0.4	x	0.8	=	56.97	(74)
North	0.9x	0.77	x	2.83	x	74.68	x	0.4	x	0.8	=	46.87	(74)
North	0.9x	0.77	x	2.75	x	74.68	x	0.4	x	0.8	=	45.54	(74)
North	0.9x	0.77	x	2.69	x	74.68	x	0.4	x	0.8	=	44.55	(74)
North	0.9x	0.77	x	1.8	x	74.68	x	0.4	x	0.8	=	29.81	(74)
North	0.9x	0.77	x	3.44	x	59.25	x	0.4	x	0.8	=	45.2	(74)
North	0.9x	0.77	x	2.83	x	59.25	x	0.4	x	0.8	=	37.18	(74)
North	0.9x	0.77	x	2.75	x	59.25	x	0.4	x	0.8	=	36.13	(74)
North	0.9x	0.77	x	2.69	x	59.25	x	0.4	x	0.8	=	35.34	(74)

DER WorkSheet: New dwelling design stage

North	0.9x	0.77	x	1.8	x	59.25	x	0.4	x	0.8	=	23.65	(74)
North	0.9x	0.77	x	3.44	x	41.52	x	0.4	x	0.8	=	31.67	(74)
North	0.9x	0.77	x	2.83	x	41.52	x	0.4	x	0.8	=	26.05	(74)
North	0.9x	0.77	x	2.75	x	41.52	x	0.4	x	0.8	=	25.32	(74)
North	0.9x	0.77	x	2.69	x	41.52	x	0.4	x	0.8	=	24.77	(74)
North	0.9x	0.77	x	1.8	x	41.52	x	0.4	x	0.8	=	16.57	(74)
North	0.9x	0.77	x	3.44	x	24.19	x	0.4	x	0.8	=	18.45	(74)
North	0.9x	0.77	x	2.83	x	24.19	x	0.4	x	0.8	=	15.18	(74)
North	0.9x	0.77	x	2.75	x	24.19	x	0.4	x	0.8	=	14.75	(74)
North	0.9x	0.77	x	2.69	x	24.19	x	0.4	x	0.8	=	14.43	(74)
North	0.9x	0.77	x	1.8	x	24.19	x	0.4	x	0.8	=	9.66	(74)
North	0.9x	0.77	x	3.44	x	13.12	x	0.4	x	0.8	=	10.01	(74)
North	0.9x	0.77	x	2.83	x	13.12	x	0.4	x	0.8	=	8.23	(74)
North	0.9x	0.77	x	2.75	x	13.12	x	0.4	x	0.8	=	8	(74)
North	0.9x	0.77	x	2.69	x	13.12	x	0.4	x	0.8	=	7.83	(74)
North	0.9x	0.77	x	1.8	x	13.12	x	0.4	x	0.8	=	5.24	(74)
North	0.9x	0.77	x	3.44	x	8.86	x	0.4	x	0.8	=	6.76	(74)
North	0.9x	0.77	x	2.83	x	8.86	x	0.4	x	0.8	=	5.56	(74)
North	0.9x	0.77	x	2.75	x	8.86	x	0.4	x	0.8	=	5.41	(74)
North	0.9x	0.77	x	2.69	x	8.86	x	0.4	x	0.8	=	5.29	(74)
North	0.9x	0.77	x	1.8	x	8.86	x	0.4	x	0.8	=	3.54	(74)
East	0.9x	0.77	x	3.44	x	19.64	x	0.4	x	0.8	=	14.98	(76)
East	0.9x	0.77	x	5.36	x	19.64	x	0.4	x	0.8	=	23.35	(76)
East	0.9x	0.77	x	3.44	x	19.64	x	0.4	x	0.8	=	14.98	(76)
East	0.9x	0.77	x	3.44	x	38.42	x	0.4	x	0.8	=	29.31	(76)
East	0.9x	0.77	x	5.36	x	38.42	x	0.4	x	0.8	=	45.67	(76)
East	0.9x	0.77	x	3.44	x	38.42	x	0.4	x	0.8	=	29.31	(76)
East	0.9x	0.77	x	3.44	x	63.27	x	0.4	x	0.8	=	48.27	(76)
East	0.9x	0.77	x	5.36	x	63.27	x	0.4	x	0.8	=	75.21	(76)
East	0.9x	0.77	x	3.44	x	63.27	x	0.4	x	0.8	=	48.27	(76)
East	0.9x	0.77	x	3.44	x	92.28	x	0.4	x	0.8	=	70.4	(76)
East	0.9x	0.77	x	5.36	x	92.28	x	0.4	x	0.8	=	109.69	(76)
East	0.9x	0.77	x	3.44	x	92.28	x	0.4	x	0.8	=	70.4	(76)
East	0.9x	0.77	x	3.44	x	113.09	x	0.4	x	0.8	=	86.27	(76)
East	0.9x	0.77	x	5.36	x	113.09	x	0.4	x	0.8	=	134.43	(76)
East	0.9x	0.77	x	3.44	x	113.09	x	0.4	x	0.8	=	86.27	(76)
East	0.9x	0.77	x	3.44	x	115.77	x	0.4	x	0.8	=	88.32	(76)
East	0.9x	0.77	x	5.36	x	115.77	x	0.4	x	0.8	=	137.61	(76)
East	0.9x	0.77	x	3.44	x	115.77	x	0.4	x	0.8	=	88.32	(76)
East	0.9x	0.77	x	3.44	x	110.22	x	0.4	x	0.8	=	84.08	(76)
East	0.9x	0.77	x	5.36	x	110.22	x	0.4	x	0.8	=	131.01	(76)

East	0.9x	0.77	x	3.44	x	110.22	x	0.4	x	0.8	=	84.08	(76)
East	0.9x	0.77	x	3.44	x	94.68	x	0.4	x	0.8	=	72.22	(76)
East	0.9x	0.77	x	5.36	x	94.68	x	0.4	x	0.8	=	112.53	(76)
East	0.9x	0.77	x	3.44	x	94.68	x	0.4	x	0.8	=	72.22	(76)
East	0.9x	0.77	x	3.44	x	73.59	x	0.4	x	0.8	=	56.14	(76)
East	0.9x	0.77	x	5.36	x	73.59	x	0.4	x	0.8	=	87.47	(76)
East	0.9x	0.77	x	3.44	x	73.59	x	0.4	x	0.8	=	56.14	(76)
East	0.9x	0.77	x	3.44	x	45.59	x	0.4	x	0.8	=	34.78	(76)
East	0.9x	0.77	x	5.36	x	45.59	x	0.4	x	0.8	=	54.19	(76)
East	0.9x	0.77	x	3.44	x	45.59	x	0.4	x	0.8	=	34.78	(76)
East	0.9x	0.77	x	3.44	x	24.49	x	0.4	x	0.8	=	18.68	(76)
East	0.9x	0.77	x	5.36	x	24.49	x	0.4	x	0.8	=	29.11	(76)
East	0.9x	0.77	x	3.44	x	24.49	x	0.4	x	0.8	=	18.68	(76)
East	0.9x	0.77	x	3.44	x	16.15	x	0.4	x	0.8	=	12.32	(76)
East	0.9x	0.77	x	5.36	x	16.15	x	0.4	x	0.8	=	19.2	(76)
East	0.9x	0.77	x	3.44	x	16.15	x	0.4	x	0.8	=	12.32	(76)
South	0.9x	0.77	x	3.44	x	46.75	x	0.4	x	0.8	=	35.67	(78)
South	0.9x	0.77	x	1.8	x	46.75	x	0.4	x	0.8	=	18.66	(78)
South	0.9x	0.77	x	4.91	x	46.75	x	0.4	x	0.8	=	50.91	(78)
South	0.9x	0.77	x	3.44	x	76.57	x	0.4	x	0.8	=	58.41	(78)
South	0.9x	0.77	x	1.8	x	76.57	x	0.4	x	0.8	=	30.56	(78)
South	0.9x	0.77	x	4.91	x	76.57	x	0.4	x	0.8	=	83.37	(78)
South	0.9x	0.77	x	3.44	x	97.53	x	0.4	x	0.8	=	74.4	(78)
South	0.9x	0.77	x	1.8	x	97.53	x	0.4	x	0.8	=	38.93	(78)
South	0.9x	0.77	x	4.91	x	97.53	x	0.4	x	0.8	=	106.2	(78)
South	0.9x	0.77	x	3.44	x	110.23	x	0.4	x	0.8	=	84.09	(78)
South	0.9x	0.77	x	1.8	x	110.23	x	0.4	x	0.8	=	44	(78)
South	0.9x	0.77	x	4.91	x	110.23	x	0.4	x	0.8	=	120.03	(78)
South	0.9x	0.77	x	3.44	x	114.87	x	0.4	x	0.8	=	87.63	(78)
South	0.9x	0.77	x	1.8	x	114.87	x	0.4	x	0.8	=	45.85	(78)
South	0.9x	0.77	x	4.91	x	114.87	x	0.4	x	0.8	=	125.08	(78)
South	0.9x	0.77	x	3.44	x	110.55	x	0.4	x	0.8	=	84.33	(78)
South	0.9x	0.77	x	1.8	x	110.55	x	0.4	x	0.8	=	44.13	(78)
South	0.9x	0.77	x	4.91	x	110.55	x	0.4	x	0.8	=	120.37	(78)
South	0.9x	0.77	x	3.44	x	108.01	x	0.4	x	0.8	=	82.4	(78)
South	0.9x	0.77	x	1.8	x	108.01	x	0.4	x	0.8	=	43.11	(78)
South	0.9x	0.77	x	4.91	x	108.01	x	0.4	x	0.8	=	117.61	(78)
South	0.9x	0.77	x	3.44	x	104.89	x	0.4	x	0.8	=	80.02	(78)
South	0.9x	0.77	x	1.8	x	104.89	x	0.4	x	0.8	=	41.87	(78)
South	0.9x	0.77	x	4.91	x	104.89	x	0.4	x	0.8	=	114.21	(78)
South	0.9x	0.77	x	3.44	x	101.89	x	0.4	x	0.8	=	77.72	(78)

South	0.9x	0.77	x	1.8	x	101.89	x	0.4	x	0.8	=	40.67	(78)
South	0.9x	0.77	x	4.91	x	101.89	x	0.4	x	0.8	=	110.94	(78)
South	0.9x	0.77	x	3.44	x	82.59	x	0.4	x	0.8	=	63	(78)
South	0.9x	0.77	x	1.8	x	82.59	x	0.4	x	0.8	=	32.97	(78)
South	0.9x	0.77	x	4.91	x	82.59	x	0.4	x	0.8	=	89.92	(78)
South	0.9x	0.77	x	3.44	x	55.42	x	0.4	x	0.8	=	42.28	(78)
South	0.9x	0.77	x	1.8	x	55.42	x	0.4	x	0.8	=	22.12	(78)
South	0.9x	0.77	x	4.91	x	55.42	x	0.4	x	0.8	=	60.34	(78)
South	0.9x	0.77	x	3.44	x	40.4	x	0.4	x	0.8	=	30.82	(78)
South	0.9x	0.77	x	1.8	x	40.4	x	0.4	x	0.8	=	16.13	(78)
South	0.9x	0.77	x	4.91	x	40.4	x	0.4	x	0.8	=	43.99	(78)

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

(83)m=	190.4	337.51	494.73	664.77	789.38	802.7	766.02	670.59	553.46	382.1	230.51	161.33	(83)

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

(84)m=	655.17	800.12	942.47	1088.41	1188.35	1178.02	1126.02	1036.86	932.16	785.13	661.52	613.5	(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	0.97	0.9	0.76	0.57	0.42	0.47	0.73	0.95	0.99	1	(86)

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

(87)m=	19.83	20.04	20.33	20.67	20.9	20.98	21	20.99	20.94	20.62	20.16	19.8	(87)

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

(88)m=	19.96	19.96	19.96	19.97	19.97	19.98	19.98	19.98	19.98	19.97	19.97	19.96	(88)

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

(89)m=	1	0.99	0.96	0.87	0.7	0.48	0.32	0.37	0.64	0.92	0.99	1	(89)

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

(90)m=	18.41	18.71	19.14	19.61	19.88	19.97	19.98	19.98	19.93	19.55	18.89	18.36	(90)

fLA = Living area ÷ (4) = 0.36 (91)

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

(92)m=	18.93	19.19	19.57	19.99	20.25	20.34	20.35	20.35	20.3	19.94	19.35	18.88	(92)

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

(93)m=	18.93	19.19	19.57	19.99	20.25	20.34	20.35	20.35	20.3	19.94	19.35	18.88	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.95	0.87	0.72	0.51	0.36	0.4	0.67	0.92	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	650.83	786.49	899.58	951.19	851.48	604	400.41	419.77	627.18	723.08	651.67	610.49	(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)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1607.88	1568.02	1431.19	1203.01	925.1	614.78	401.74	422.29	666.71	1010.7	1330.84	1601.3	(97)

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

(98)m=	712.04	525.19	395.52	181.31	54.78	0	0	0	0	213.99	489	737.16

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3308.98 (98)

Space heating requirement in kWh/m²/year 34.76 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		3308.98	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	3639.88	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		2194.3	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2413.73	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	60.54	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		223.14	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	223.14	(331)
Energy for lighting (calculated in Appendix L)		390.97	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-984.53	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

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

DER WorkSheet: New dwelling design stage

CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	984.9	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	31.42	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	1016.31	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			1016.31	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	115.81	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	202.91	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-510.97	(380)
Total CO2, kg/year	sum of (376)…(382) =			824.07	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			8.66	(384)
EI rating (section 14)				92.12	(385)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 011

Address : AC 011, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	95.2	(1a)	x	2.9	(2a)	=	276.08	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	95.2	(4)						
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	276.08	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(18)

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

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.33	(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

TER WorkSheet: New dwelling design stage

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

0.42	0.41	0.41	0.36	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39

Calculate effective air change rate for the applicable case

If mechanical ventilation:	0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0	(23c)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			3.89	x	1.2	=	4.668			(26)
Windows Type 1			1.91	x1/[1/(1.4)+ 0.04]		=	2.53			(27)
Windows Type 2			1.91	x1/[1/(1.4)+ 0.04]		=	2.53			(27)
Windows Type 3			2.97	x1/[1/(1.4)+ 0.04]		=	3.94			(27)
Windows Type 4			1.91	x1/[1/(1.4)+ 0.04]		=	2.53			(27)
Windows Type 5			1.91	x1/[1/(1.4)+ 0.04]		=	2.53			(27)
Windows Type 6			1.57	x1/[1/(1.4)+ 0.04]		=	2.08			(27)
Windows Type 7			1.53	x1/[1/(1.4)+ 0.04]		=	2.03			(27)
Windows Type 8			1.49	x1/[1/(1.4)+ 0.04]		=	1.98			(27)
Windows Type 9			1	x1/[1/(1.4)+ 0.04]		=	1.33			(27)
Windows Type 10			1	x1/[1/(1.4)+ 0.04]		=	1.33			(27)
Windows Type 11			2.72	x1/[1/(1.4)+ 0.04]		=	3.61			(27)
Floor			95.2	x	0.13	=	12.376			(28)
Walls	88.28	23.81	64.47	x	0.18	=	11.6			(29)
Total area of elements, m²			183.48							(31)
Party wall			24.88	x	0	=	0			(32)

** 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) =	55.06	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	0	(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 — 12.99 (36)

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

Total fabric heat loss — (33) + (36) = 68.05 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	53.7	53.39	53.08	51.62	51.35	50.08	50.08	49.84	50.57	51.35	51.9	52.48	(38)

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

(39)m=	121.75	121.43	121.12	119.67	119.39	118.12	118.12	117.89	118.61	119.39	119.94	120.52

Average = Sum(39)$_{1...12}$ /12= 119.66 (39)

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

(40)m=	1.28	1.28	1.27	1.26	1.25	1.24	1.24	1.24	1.25	1.25	1.26	1.27

Average = Sum(40)$_{1...12}$ /12= 1.26 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.69 (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 — 98.1 (43)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	107.91	103.98	100.06	96.14	92.21	88.29	88.29	92.21	96.14	100.06	103.98	107.91

Total = Sum(44)$_{1...12}$ = 1177.17 (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=	160.02	139.96	144.42	125.91	120.82	104.25	96.61	110.86	112.18	130.74	142.71	154.97

Total = Sum(45)$_{1...12}$ = 1543.46 (45)

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

(46)m=	24	20.99	21.66	18.89	18.12	15.64	14.49	16.63	16.83	19.61	21.41	23.25	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 150 (47)

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

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

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (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)		0.75	(55)

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

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

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

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

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

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

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

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

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

(62)m=	206.62	182.04	191.02	171	167.41	149.35	143.2	157.45	157.27	177.33	187.8	201.57	(62)

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

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	206.62	182.04	191.02	171	167.41	149.35	143.2	157.45	157.27	177.33	187.8	201.57

Output from water heater (annual)$_{1…12}$ — 2092.08 (64)

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

(65)m=	90.48	80.2	85.3	77.94	77.45	70.74	69.4	74.14	73.37	80.75	83.52	88.8	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	134.52	(66)

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

(67)m=	22.14	19.66	15.99	12.11	9.05	7.64	8.26	10.73	14.4	18.29	21.34	22.75	(67)

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

(68)m=	248.33	250.9	244.41	230.59	213.14	196.73	185.78	183.2	189.69	203.52	220.97	237.37	(68)

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

(69)m=	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	36.45	(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=	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	-107.62	(71)

Water heating gains (Table 5)

(72)m=	121.62	119.35	114.65	108.25	104.1	98.25	93.28	99.65	101.91	108.53	116.01	119.36	(72)

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

(73)m=	458.44	456.27	441.4	417.3	392.64	368.98	353.67	359.93	372.36	396.69	424.68	445.84	(73)

6. Solar gains:

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

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.91	x	10.63	x	0.63	x	0.7	=	6.21	(74)
North	0.9x	0.77	x	1.57	x	10.63	x	0.63	x	0.7	=	5.1	(74)
North	0.9x	0.77	x	1.53	x	10.63	x	0.63	x	0.7	=	4.97	(74)
North	0.9x	0.77	x	1.49	x	10.63	x	0.63	x	0.7	=	4.84	(74)
North	0.9x	0.77	x	1	x	10.63	x	0.63	x	0.7	=	3.25	(74)
North	0.9x	0.77	x	1.91	x	20.32	x	0.63	x	0.7	=	11.86	(74)
North	0.9x	0.77	x	1.57	x	20.32	x	0.63	x	0.7	=	9.75	(74)
North	0.9x	0.77	x	1.53	x	20.32	x	0.63	x	0.7	=	9.5	(74)
North	0.9x	0.77	x	1.49	x	20.32	x	0.63	x	0.7	=	9.25	(74)
North	0.9x	0.77	x	1	x	20.32	x	0.63	x	0.7	=	6.21	(74)
North	0.9x	0.77	x	1.91	x	34.53	x	0.63	x	0.7	=	20.16	(74)
North	0.9x	0.77	x	1.57	x	34.53	x	0.63	x	0.7	=	16.57	(74)
North	0.9x	0.77	x	1.53	x	34.53	x	0.63	x	0.7	=	16.15	(74)
North	0.9x	0.77	x	1.49	x	34.53	x	0.63	x	0.7	=	15.72	(74)
North	0.9x	0.77	x	1	x	34.53	x	0.63	x	0.7	=	10.55	(74)
North	0.9x	0.77	x	1.91	x	55.46	x	0.63	x	0.7	=	32.38	(74)
North	0.9x	0.77	x	1.57	x	55.46	x	0.63	x	0.7	=	26.61	(74)
North	0.9x	0.77	x	1.53	x	55.46	x	0.63	x	0.7	=	25.93	(74)
North	0.9x	0.77	x	1.49	x	55.46	x	0.63	x	0.7	=	25.26	(74)
North	0.9x	0.77	x	1	x	55.46	x	0.63	x	0.7	=	16.95	(74)
North	0.9x	0.77	x	1.91	x	74.72	x	0.63	x	0.7	=	43.61	(74)
North	0.9x	0.77	x	1.57	x	74.72	x	0.63	x	0.7	=	35.85	(74)
North	0.9x	0.77	x	1.53	x	74.72	x	0.63	x	0.7	=	34.94	(74)
North	0.9x	0.77	x	1.49	x	74.72	x	0.63	x	0.7	=	34.02	(74)
North	0.9x	0.77	x	1	x	74.72	x	0.63	x	0.7	=	22.83	(74)
North	0.9x	0.77	x	1.91	x	79.99	x	0.63	x	0.7	=	46.69	(74)
North	0.9x	0.77	x	1.57	x	79.99	x	0.63	x	0.7	=	38.38	(74)
North	0.9x	0.77	x	1.53	x	79.99	x	0.63	x	0.7	=	37.4	(74)
North	0.9x	0.77	x	1.49	x	79.99	x	0.63	x	0.7	=	36.42	(74)
North	0.9x	0.77	x	1	x	79.99	x	0.63	x	0.7	=	24.44	(74)
North	0.9x	0.77	x	1.91	x	74.68	x	0.63	x	0.7	=	43.59	(74)
North	0.9x	0.77	x	1.57	x	74.68	x	0.63	x	0.7	=	35.83	(74)
North	0.9x	0.77	x	1.53	x	74.68	x	0.63	x	0.7	=	34.92	(74)
North	0.9x	0.77	x	1.49	x	74.68	x	0.63	x	0.7	=	34	(74)
North	0.9x	0.77	x	1	x	74.68	x	0.63	x	0.7	=	22.82	(74)
North	0.9x	0.77	x	1.91	x	59.25	x	0.63	x	0.7	=	34.58	(74)
North	0.9x	0.77	x	1.57	x	59.25	x	0.63	x	0.7	=	28.43	(74)
North	0.9x	0.77	x	1.53	x	59.25	x	0.63	x	0.7	=	27.7	(74)
North	0.9x	0.77	x	1.49	x	59.25	x	0.63	x	0.7	=	26.98	(74)

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North	0.9x	0.77	x	1	x	59.25	x	0.63	x	0.7	=	18.11	(74)
North	0.9x	0.77	x	1.91	x	41.52	x	0.63	x	0.7	=	24.23	(74)
North	0.9x	0.77	x	1.57	x	41.52	x	0.63	x	0.7	=	19.92	(74)
North	0.9x	0.77	x	1.53	x	41.52	x	0.63	x	0.7	=	19.41	(74)
North	0.9x	0.77	x	1.49	x	41.52	x	0.63	x	0.7	=	18.91	(74)
North	0.9x	0.77	x	1	x	41.52	x	0.63	x	0.7	=	12.69	(74)
North	0.9x	0.77	x	1.91	x	24.19	x	0.63	x	0.7	=	14.12	(74)
North	0.9x	0.77	x	1.57	x	24.19	x	0.63	x	0.7	=	11.61	(74)
North	0.9x	0.77	x	1.53	x	24.19	x	0.63	x	0.7	=	11.31	(74)
North	0.9x	0.77	x	1.49	x	24.19	x	0.63	x	0.7	=	11.01	(74)
North	0.9x	0.77	x	1	x	24.19	x	0.63	x	0.7	=	7.39	(74)
North	0.9x	0.77	x	1.91	x	13.12	x	0.63	x	0.7	=	7.66	(74)
North	0.9x	0.77	x	1.57	x	13.12	x	0.63	x	0.7	=	6.29	(74)
North	0.9x	0.77	x	1.53	x	13.12	x	0.63	x	0.7	=	6.13	(74)
North	0.9x	0.77	x	1.49	x	13.12	x	0.63	x	0.7	=	5.97	(74)
North	0.9x	0.77	x	1	x	13.12	x	0.63	x	0.7	=	4.01	(74)
North	0.9x	0.77	x	1.91	x	8.86	x	0.63	x	0.7	=	5.17	(74)
North	0.9x	0.77	x	1.57	x	8.86	x	0.63	x	0.7	=	4.25	(74)
North	0.9x	0.77	x	1.53	x	8.86	x	0.63	x	0.7	=	4.14	(74)
North	0.9x	0.77	x	1.49	x	8.86	x	0.63	x	0.7	=	4.04	(74)
North	0.9x	0.77	x	1	x	8.86	x	0.63	x	0.7	=	2.71	(74)
East	0.9x	0.77	x	1.91	x	19.64	x	0.63	x	0.7	=	11.46	(76)
East	0.9x	0.77	x	2.97	x	19.64	x	0.63	x	0.7	=	17.83	(76)
East	0.9x	0.77	x	1.91	x	19.64	x	0.63	x	0.7	=	11.46	(76)
East	0.9x	0.77	x	1.91	x	38.42	x	0.63	x	0.7	=	22.43	(76)
East	0.9x	0.77	x	2.97	x	38.42	x	0.63	x	0.7	=	34.87	(76)
East	0.9x	0.77	x	1.91	x	38.42	x	0.63	x	0.7	=	22.43	(76)
East	0.9x	0.77	x	1.91	x	63.27	x	0.63	x	0.7	=	36.93	(76)
East	0.9x	0.77	x	2.97	x	63.27	x	0.63	x	0.7	=	57.43	(76)
East	0.9x	0.77	x	1.91	x	63.27	x	0.63	x	0.7	=	36.93	(76)
East	0.9x	0.77	x	1.91	x	92.28	x	0.63	x	0.7	=	53.87	(76)
East	0.9x	0.77	x	2.97	x	92.28	x	0.63	x	0.7	=	83.76	(76)
East	0.9x	0.77	x	1.91	x	92.28	x	0.63	x	0.7	=	53.87	(76)
East	0.9x	0.77	x	1.91	x	113.09	x	0.63	x	0.7	=	66.01	(76)
East	0.9x	0.77	x	2.97	x	113.09	x	0.63	x	0.7	=	102.65	(76)
East	0.9x	0.77	x	1.91	x	113.09	x	0.63	x	0.7	=	66.01	(76)
East	0.9x	0.77	x	1.91	x	115.77	x	0.63	x	0.7	=	67.58	(76)
East	0.9x	0.77	x	2.97	x	115.77	x	0.63	x	0.7	=	105.08	(76)
East	0.9x	0.77	x	1.91	x	115.77	x	0.63	x	0.7	=	67.58	(76)
East	0.9x	0.77	x	1.91	x	110.22	x	0.63	x	0.7	=	64.34	(76)
East	0.9x	0.77	x	2.97	x	110.22	x	0.63	x	0.7	=	100.04	(76)

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East	0.9x	0.77	x	1.91	x	110.22	x	0.63	x	0.7	=	64.34	(76)
East	0.9x	0.77	x	1.91	x	94.68	x	0.63	x	0.7	=	55.26	(76)
East	0.9x	0.77	x	2.97	x	94.68	x	0.63	x	0.7	=	85.93	(76)
East	0.9x	0.77	x	1.91	x	94.68	x	0.63	x	0.7	=	55.26	(76)
East	0.9x	0.77	x	1.91	x	73.59	x	0.63	x	0.7	=	42.96	(76)
East	0.9x	0.77	x	2.97	x	73.59	x	0.63	x	0.7	=	66.79	(76)
East	0.9x	0.77	x	1.91	x	73.59	x	0.63	x	0.7	=	42.96	(76)
East	0.9x	0.77	x	1.91	x	45.59	x	0.63	x	0.7	=	26.61	(76)
East	0.9x	0.77	x	2.97	x	45.59	x	0.63	x	0.7	=	41.38	(76)
East	0.9x	0.77	x	1.91	x	45.59	x	0.63	x	0.7	=	26.61	(76)
East	0.9x	0.77	x	1.91	x	24.49	x	0.63	x	0.7	=	14.29	(76)
East	0.9x	0.77	x	2.97	x	24.49	x	0.63	x	0.7	=	22.23	(76)
East	0.9x	0.77	x	1.91	x	24.49	x	0.63	x	0.7	=	14.29	(76)
East	0.9x	0.77	x	1.91	x	16.15	x	0.63	x	0.7	=	9.43	(76)
East	0.9x	0.77	x	2.97	x	16.15	x	0.63	x	0.7	=	14.66	(76)
East	0.9x	0.77	x	1.91	x	16.15	x	0.63	x	0.7	=	9.43	(76)
South	0.9x	0.77	x	1.91	x	46.75	x	0.63	x	0.7	=	27.29	(78)
South	0.9x	0.77	x	1	x	46.75	x	0.63	x	0.7	=	14.29	(78)
South	0.9x	0.77	x	2.72	x	46.75	x	0.63	x	0.7	=	38.86	(78)
South	0.9x	0.77	x	1.91	x	76.57	x	0.63	x	0.7	=	44.69	(78)
South	0.9x	0.77	x	1	x	76.57	x	0.63	x	0.7	=	23.4	(78)
South	0.9x	0.77	x	2.72	x	76.57	x	0.63	x	0.7	=	63.65	(78)
South	0.9x	0.77	x	1.91	x	97.53	x	0.63	x	0.7	=	56.93	(78)
South	0.9x	0.77	x	1	x	97.53	x	0.63	x	0.7	=	29.81	(78)
South	0.9x	0.77	x	2.72	x	97.53	x	0.63	x	0.7	=	81.08	(78)
South	0.9x	0.77	x	1.91	x	110.23	x	0.63	x	0.7	=	64.35	(78)
South	0.9x	0.77	x	1	x	110.23	x	0.63	x	0.7	=	33.69	(78)
South	0.9x	0.77	x	2.72	x	110.23	x	0.63	x	0.7	=	91.63	(78)
South	0.9x	0.77	x	1.91	x	114.87	x	0.63	x	0.7	=	67.05	(78)
South	0.9x	0.77	x	1	x	114.87	x	0.63	x	0.7	=	35.11	(78)
South	0.9x	0.77	x	2.72	x	114.87	x	0.63	x	0.7	=	95.49	(78)
South	0.9x	0.77	x	1.91	x	110.55	x	0.63	x	0.7	=	64.53	(78)
South	0.9x	0.77	x	1	x	110.55	x	0.63	x	0.7	=	33.78	(78)
South	0.9x	0.77	x	2.72	x	110.55	x	0.63	x	0.7	=	91.89	(78)
South	0.9x	0.77	x	1.91	x	108.01	x	0.63	x	0.7	=	63.05	(78)
South	0.9x	0.77	x	1	x	108.01	x	0.63	x	0.7	=	33.01	(78)
South	0.9x	0.77	x	2.72	x	108.01	x	0.63	x	0.7	=	89.79	(78)
South	0.9x	0.77	x	1.91	x	104.89	x	0.63	x	0.7	=	61.23	(78)
South	0.9x	0.77	x	1	x	104.89	x	0.63	x	0.7	=	32.06	(78)
South	0.9x	0.77	x	2.72	x	104.89	x	0.63	x	0.7	=	87.2	(78)
South	0.9x	0.77	x	1.91	x	101.89	x	0.63	x	0.7	=	59.47	(78)

South	0.9x	0.77	x	1	x	101.89	x	0.63	x	0.7	=	31.14	(78)
South	0.9x	0.77	x	2.72	x	101.89	x	0.63	x	0.7	=	84.69	(78)
South	0.9x	0.77	x	1.91	x	82.59	x	0.63	x	0.7	=	48.21	(78)
South	0.9x	0.77	x	1	x	82.59	x	0.63	x	0.7	=	25.24	(78)
South	0.9x	0.77	x	2.72	x	82.59	x	0.63	x	0.7	=	68.65	(78)
South	0.9x	0.77	x	1.91	x	55.42	x	0.63	x	0.7	=	32.35	(78)
South	0.9x	0.77	x	1	x	55.42	x	0.63	x	0.7	=	16.94	(78)
South	0.9x	0.77	x	2.72	x	55.42	x	0.63	x	0.7	=	46.07	(78)
South	0.9x	0.77	x	1.91	x	40.4	x	0.63	x	0.7	=	23.58	(78)
South	0.9x	0.77	x	1	x	40.4	x	0.63	x	0.7	=	12.35	(78)
South	0.9x	0.77	x	2.72	x	40.4	x	0.63	x	0.7	=	33.58	(78)

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

(83)m=	145.57	258.05	378.26	508.29	603.58	613.78	585.73	512.74	423.17	292.14	176.24	123.34	(83)

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

(84)m=	604.01	714.32	819.67	925.59	996.22	982.76	939.39	872.68	795.53	688.84	600.91	569.18	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.95	0.87	0.7	0.54	0.6	0.84	0.97	0.99	1	(86)

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

(87)m=	19.62	19.8	20.08	20.45	20.76	20.94	20.99	20.98	20.85	20.45	19.97	19.59	(87)

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

(88)m=	19.86	19.86	19.86	19.87	19.88	19.89	19.89	19.89	19.88	19.88	19.87	19.87	(88)

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

(89)m=	1	0.99	0.98	0.93	0.82	0.61	0.41	0.46	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=	18.03	18.29	18.71	19.24	19.65	19.85	19.88	19.88	19.77	19.24	18.55	18	(90)

fLA = Living area ÷ (4) = 0.36 (91)

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

(92)m=	18.61	18.84	19.21	19.68	20.05	20.24	20.28	20.28	20.16	19.68	19.06	18.58	(92)

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

(93)m=	18.61	18.84	19.21	19.68	20.05	20.24	20.28	20.28	20.16	19.68	19.06	18.58	(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	0.82	0.64	0.46	0.51	0.78	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	601.05	706.66	798.46	860.46	821.49	628.25	428.91	446.88	621.18	656.45	594.89	567.04	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

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Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1742.26	1692.96	1539.27	1289.88	996.97	666.56	435.11	457.33	718.91	1083.9	1434.84	1732.87	(97)

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

(98)m=	849.06	662.79	551.17	309.18	130.56	0	0	0	0	318.02	604.76	867.38

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4292.92 (98)

Space heating requirement in kWh/m²/year 45.09 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	849.06	662.79	551.17	309.18	130.56	0	0	0	0	318.02	604.76	867.38	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	908.09	708.87	589.48	330.67	139.63	0	0	0	0	340.13	646.8	927.68	(211)

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 4591.36 (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)

206.62	182.04	191.02	171	167.41	149.35	143.2	157.45	157.27	177.33	187.8	201.57

Efficiency of water heater 79.8 (216)

(217)m=	88.19	87.96	87.48	86.38	84.16	79.8	79.8	79.8	79.8	86.35	87.71	88.27	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	234.3	206.96	218.35	197.98	198.92	187.15	179.45	197.31	197.09	205.35	214.11	228.36

Total = Sum(219a)$_{1...12}$ = 2465.34 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			4591.36	
Water heating fuel used			2465.34	
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			390.97	(232)

12a. CO2 emissions – Individual heating systems including micro-CHP

TER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	991.73	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	532.51	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1524.25	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	202.91	(268)
Total CO2, kg/year			sum of (265)…(271) =		1766.09	(272)

TER =	27.36	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:37:37

Project Information:

Assessed By:	John Simpson (STRO006273)	**Building Type:**	Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 75.1m²	
Site Reference :	Maitland Park Estate	**Plot Reference:**	AC 106
Address :	AC 106, Aspen Court, Maitland Park Estate, London, NW3 2EH		

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	22.16 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	5.04 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	37.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	32.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: West	1.67m²	
Windows facing: East	1.66m²	
Windows facing: East	6.18m²	
Windows facing: West	2.24m²	
Windows facing: West	1.5m²	
Windows facing: East	4.1m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features	
Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 106

Address : AC 106, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	75.1	(1a) x	2.6	(2a) =	195.26	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	75.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	195.26	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			1.67	x1/[1/(1.4)+ 0.04]		=	2.21			(27)
Windows Type 2			1.66	x1/[1/(1.4)+ 0.04]		=	2.2			(27)
Windows Type 3			6.18	x1/[1/(1.4)+ 0.04]		=	8.19			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 5			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Windows Type 6			4.1	x1/[1/(1.4)+ 0.04]		=	5.44			(27)
Walls	47.92	17.35	30.57	x	0.12	=	3.67			(29)
Total area of elements, m²			47.92							(31)
Party wall			44.62	x	0	=	0			(32)

** 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) = 26.67 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 7.43 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.1 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	14.55	14.42	14.28	13.6	13.46	12.77	12.77	12.64	13.05	13.46	13.73	14.01	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	48.65	48.51	48.38	47.69	47.55	46.87	46.87	46.73	47.14	47.55	47.83	48.1	

Average = Sum(39)$_{1…12}$ /12= 47.66 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.65	0.65	0.64	0.64	0.63	0.62	0.62	0.62	0.63	0.63	0.64	0.64

Average = Sum(40)$_{1...12}$ /12= 0.63 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.36 (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 90.33 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	99.36	95.75	92.14	88.52	84.91	81.3	81.3	84.91	88.52	92.14	95.75	99.36

Total = Sum(44)$_{1...12}$ = 1083.95 (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=	147.35	128.87	132.99	115.94	111.25	96	88.96	102.08	103.3	120.38	131.41	142.7

Total = Sum(45)$_{1...12}$ = 1421.23 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.1	19.33	19.95	17.39	16.69	14.4	13.34	15.31	15.49	18.06	19.71	21.41	(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) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	202.63	178.8	188.26	169.43	166.52	149.49	144.23	157.36	156.79	175.66	184.9	197.98	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	202.63	178.8	188.26	169.43	166.52	149.49	144.23	157.36	156.79	175.66	184.9	197.98	

Output from water heater (annual)$_{1...12}$ 2072.07 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	93.22	82.79	88.44	81.35	81.21	74.71	73.8	78.16	77.14	84.25	86.49	91.67	(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=	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.62	16.54	13.45	10.18	7.61	6.43	6.94	9.03	12.12	15.38	17.96	19.14	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	208.9	211.06	205.6	193.97	179.29	165.5	156.28	154.11	159.57	171.2	185.88	199.68	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	(71)

Water heating gains (Table 5)

(72)m=	125.29	123.2	118.87	112.98	109.16	103.77	99.19	105.06	107.14	113.24	120.12	123.21	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	411.26	409.26	396.37	375.59	354.51	334.14	320.87	326.65	337.28	358.27	382.41	400.48	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	1.66	x	19.64	x	0.4	x	0.8	=	7.23	(76)
East	0.9x	0.77	x	6.18	x	19.64	x	0.4	x	0.8	=	26.92	(76)
East	0.9x	0.77	x	4.1	x	19.64	x	0.4	x	0.8	=	17.86	(76)
East	0.9x	0.77	x	1.66	x	38.42	x	0.4	x	0.8	=	14.14	(76)
East	0.9x	0.77	x	6.18	x	38.42	x	0.4	x	0.8	=	52.65	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	4.1	x	38.42	x	0.4	x	0.8	=	34.93	(76)
East	0.9x	0.77	x	1.66	x	63.27	x	0.4	x	0.8	=	23.29	(76)
East	0.9x	0.77	x	6.18	x	63.27	x	0.4	x	0.8	=	86.71	(76)
East	0.9x	0.77	x	4.1	x	63.27	x	0.4	x	0.8	=	57.53	(76)
East	0.9x	0.77	x	1.66	x	92.28	x	0.4	x	0.8	=	33.97	(76)
East	0.9x	0.77	x	6.18	x	92.28	x	0.4	x	0.8	=	126.47	(76)
East	0.9x	0.77	x	4.1	x	92.28	x	0.4	x	0.8	=	83.9	(76)
East	0.9x	0.77	x	1.66	x	113.09	x	0.4	x	0.8	=	41.63	(76)
East	0.9x	0.77	x	6.18	x	113.09	x	0.4	x	0.8	=	154.99	(76)
East	0.9x	0.77	x	4.1	x	113.09	x	0.4	x	0.8	=	102.83	(76)
East	0.9x	0.77	x	1.66	x	115.77	x	0.4	x	0.8	=	42.62	(76)
East	0.9x	0.77	x	6.18	x	115.77	x	0.4	x	0.8	=	158.66	(76)
East	0.9x	0.77	x	4.1	x	115.77	x	0.4	x	0.8	=	105.26	(76)
East	0.9x	0.77	x	1.66	x	110.22	x	0.4	x	0.8	=	40.57	(76)
East	0.9x	0.77	x	6.18	x	110.22	x	0.4	x	0.8	=	151.05	(76)
East	0.9x	0.77	x	4.1	x	110.22	x	0.4	x	0.8	=	100.21	(76)
East	0.9x	0.77	x	1.66	x	94.68	x	0.4	x	0.8	=	34.85	(76)
East	0.9x	0.77	x	6.18	x	94.68	x	0.4	x	0.8	=	129.75	(76)
East	0.9x	0.77	x	4.1	x	94.68	x	0.4	x	0.8	=	86.08	(76)
East	0.9x	0.77	x	1.66	x	73.59	x	0.4	x	0.8	=	27.09	(76)
East	0.9x	0.77	x	6.18	x	73.59	x	0.4	x	0.8	=	100.85	(76)
East	0.9x	0.77	x	4.1	x	73.59	x	0.4	x	0.8	=	66.91	(76)
East	0.9x	0.77	x	1.66	x	45.59	x	0.4	x	0.8	=	16.78	(76)
East	0.9x	0.77	x	6.18	x	45.59	x	0.4	x	0.8	=	62.48	(76)
East	0.9x	0.77	x	4.1	x	45.59	x	0.4	x	0.8	=	41.45	(76)
East	0.9x	0.77	x	1.66	x	24.49	x	0.4	x	0.8	=	9.01	(76)
East	0.9x	0.77	x	6.18	x	24.49	x	0.4	x	0.8	=	33.56	(76)
East	0.9x	0.77	x	4.1	x	24.49	x	0.4	x	0.8	=	22.27	(76)
East	0.9x	0.77	x	1.66	x	16.15	x	0.4	x	0.8	=	5.95	(76)
East	0.9x	0.77	x	6.18	x	16.15	x	0.4	x	0.8	=	22.13	(76)
East	0.9x	0.77	x	4.1	x	16.15	x	0.4	x	0.8	=	14.68	(76)
West	0.9x	0.77	x	1.67	x	19.64	x	0.4	x	0.8	=	7.27	(80)
West	0.9x	0.77	x	2.24	x	19.64	x	0.4	x	0.8	=	9.76	(80)
West	0.9x	0.77	x	1.5	x	19.64	x	0.4	x	0.8	=	6.53	(80)
West	0.9x	0.77	x	1.67	x	38.42	x	0.4	x	0.8	=	14.23	(80)
West	0.9x	0.77	x	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(80)
West	0.9x	0.77	x	1.5	x	38.42	x	0.4	x	0.8	=	12.78	(80)
West	0.9x	0.77	x	1.67	x	63.27	x	0.4	x	0.8	=	23.43	(80)
West	0.9x	0.77	x	2.24	x	63.27	x	0.4	x	0.8	=	31.43	(80)
West	0.9x	0.77	x	1.5	x	63.27	x	0.4	x	0.8	=	21.05	(80)
West	0.9x	0.77	x	1.67	x	92.28	x	0.4	x	0.8	=	34.17	(80)

West	0.9x	0.77	x	2.24	x	92.28	x	0.4	x	0.8	=	45.84	(80)
West	0.9x	0.77	x	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(80)
West	0.9x	0.77	x	1.67	x	113.09	x	0.4	x	0.8	=	41.88	(80)
West	0.9x	0.77	x	2.24	x	113.09	x	0.4	x	0.8	=	56.18	(80)
West	0.9x	0.77	x	1.5	x	113.09	x	0.4	x	0.8	=	37.62	(80)
West	0.9x	0.77	x	1.67	x	115.77	x	0.4	x	0.8	=	42.87	(80)
West	0.9x	0.77	x	2.24	x	115.77	x	0.4	x	0.8	=	57.51	(80)
West	0.9x	0.77	x	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(80)
West	0.9x	0.77	x	1.67	x	110.22	x	0.4	x	0.8	=	40.82	(80)
West	0.9x	0.77	x	2.24	x	110.22	x	0.4	x	0.8	=	54.75	(80)
West	0.9x	0.77	x	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(80)
West	0.9x	0.77	x	1.67	x	94.68	x	0.4	x	0.8	=	35.06	(80)
West	0.9x	0.77	x	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(80)
West	0.9x	0.77	x	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(80)
West	0.9x	0.77	x	1.67	x	73.59	x	0.4	x	0.8	=	27.25	(80)
West	0.9x	0.77	x	2.24	x	73.59	x	0.4	x	0.8	=	36.55	(80)
West	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(80)
West	0.9x	0.77	x	1.67	x	45.59	x	0.4	x	0.8	=	16.88	(80)
West	0.9x	0.77	x	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(80)
West	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(80)
West	0.9x	0.77	x	1.67	x	24.49	x	0.4	x	0.8	=	9.07	(80)
West	0.9x	0.77	x	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(80)
West	0.9x	0.77	x	1.67	x	16.15	x	0.4	x	0.8	=	5.98	(80)
West	0.9x	0.77	x	2.24	x	16.15	x	0.4	x	0.8	=	8.02	(80)
West	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	=	5.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	75.57	147.82	243.45	355.05	435.13	445.43	424.07	364.27	283.14	175.41	94.22	62.14	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	486.83	557.08	639.82	730.64	789.64	779.57	744.94	690.91	620.42	533.68	476.63	462.62	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.93	0.76	0.56	0.38	0.28	0.31	0.52	0.86	0.98	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.55	20.68	20.85	20.97	21	21	21	21	21	20.95	20.73	20.52	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.39	20.39	20.39	20.4	20.4	20.41	20.41	20.41	20.41	20.4	20.4	20.39	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.91	0.73	0.52	0.35	0.24	0.27	0.48	0.82	0.98	0.99	(89)

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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.78	19.97	20.21	20.37	20.4	20.41	20.41	20.41	20.4	20.35	20.05	19.75	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.05	20.22	20.44	20.58	20.61	20.62	20.62	20.62	20.61	20.56	20.29	20.02	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.05	20.22	20.44	20.58	20.61	20.62	20.62	20.62	20.61	20.56	20.29	20.02	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.97	0.91	0.74	0.54	0.36	0.25	0.29	0.49	0.83	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	482.35	542.81	584.12	541.93	422.52	281.91	188.21	197.05	306.6	444.09	464.23	459.57	(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=	766.28	743.1	674.15	557.13	423.63	281.95	188.21	197.06	307.03	473.49	630.77	760.97	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	211.24	134.6	66.98	10.95	0.83	0	0	0	0	21.88	119.91	224.24	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 790.63 (98)

Space heating requirement in kWh/m²/year 10.53 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		790.63	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	869.69	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 2072.07

If DHW from community scheme:

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Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2279.27	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	31.49	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		157.82	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	157.82	(331)
Energy for lighting (calculated in Appendix L)		328.89	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-776.39	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	512.32	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	16.34	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	528.67	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				528.67	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	81.91	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	170.7	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-402.95	(380)
Total CO2, kg/year	sum of (376)…(382) =				378.32	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				5.04	(384)
EI rating (section 14)					95.78	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 106

Address : AC 106, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	75.1	(1a) x	2.6	(2a) =	195.26	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	75.1	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		195.26	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.15	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			1.67	x1/[1/(1.4)+ 0.04]	=	2.21			(27)
Windows Type 2			1.66	x1/[1/(1.4)+ 0.04]	=	2.2			(27)
Windows Type 3			6.18	x1/[1/(1.4)+ 0.04]	=	8.19			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 5			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 6			4.1	x1/[1/(1.4)+ 0.04]	=	5.44			(27)
Walls	47.92	17.35	30.57	x 0.18	=	5.5			(29)
Total area of elements, m²			47.92						(31)
Party wall			44.62	x 0	=	0			(32)

** 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) = 28.5 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.2 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 33.71 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	38.38	38.14	37.91	36.81	36.6	35.64	35.64	35.46	36.01	36.6	37.02	37.45	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	72.09	71.85	71.62	70.51	70.31	69.35	69.35	69.17	69.72	70.31	70.73	71.16	

Average = Sum(39)1…12 /12= 70.51 (39)

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Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	0.96	0.96	0.95	0.94	0.94	0.92	0.92	0.92	0.93	0.94	0.94	0.95

Average = Sum(40)$_{1…12}$ /12= 0.94 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.36 (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 — 90.33 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	99.36	95.75	92.14	88.52	84.91	81.3	81.3	84.91	88.52	92.14	95.75	99.36

Total = Sum(44)$_{1…12}$ = 1083.95 (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=	147.35	128.87	132.99	115.94	111.25	96	88.96	102.08	103.3	120.38	131.41	142.7

Total = Sum(45)$_{1…12}$ = 1421.23 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.1	19.33	19.95	17.39	16.69	14.4	13.34	15.31	15.49	18.06	19.71	21.41	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (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) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	193.95	170.96	179.58	161.03	157.84	141.09	135.55	148.67	148.39	166.98	176.5	189.3	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	193.95	170.96	179.58	161.03	157.84	141.09	135.55	148.67	148.39	166.98	176.5	189.3	

Output from water heater (annual)$_{1...12}$ 1969.84 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	86.27	76.52	81.49	74.62	74.27	67.99	66.85	71.22	70.42	77.3	79.77	84.72	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18.62	16.54	13.45	10.18	7.61	6.43	6.94	9.03	12.12	15.38	17.96	19.14	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	208.9	211.06	205.6	193.97	179.29	165.5	156.28	154.11	159.57	171.2	185.88	199.68	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	(69)
Pumps and fans gains (Table 5a)													
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	(71)
Water heating gains (Table 5)													
(72)m=	115.95	113.87	109.53	103.64	99.82	94.43	89.86	95.72	97.81	103.9	110.79	113.88	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	404.92	402.92	390.04	369.25	348.18	327.81	314.53	320.31	330.95	351.94	376.08	394.15	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	0.77	x	1.66	x	19.64	x	0.63	x	0.7	=	9.96	(76)
East	0.9x	0.77	x	6.18	x	19.64	x	0.63	x	0.7	=	37.09	(76)
East	0.9x	0.77	x	4.1	x	19.64	x	0.63	x	0.7	=	24.61	(76)
East	0.9x	0.77	x	1.66	x	38.42	x	0.63	x	0.7	=	19.49	(76)
East	0.9x	0.77	x	6.18	x	38.42	x	0.63	x	0.7	=	72.56	(76)

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East	0.9x	0.77	x	4.1	x	38.42	x	0.63	x	0.7	=	48.14	(76)
East	0.9x	0.77	x	1.66	x	63.27	x	0.63	x	0.7	=	32.1	(76)
East	0.9x	0.77	x	6.18	x	63.27	x	0.63	x	0.7	=	119.5	(76)
East	0.9x	0.77	x	4.1	x	63.27	x	0.63	x	0.7	=	79.28	(76)
East	0.9x	0.77	x	1.66	x	92.28	x	0.63	x	0.7	=	46.82	(76)
East	0.9x	0.77	x	6.18	x	92.28	x	0.63	x	0.7	=	174.29	(76)
East	0.9x	0.77	x	4.1	x	92.28	x	0.63	x	0.7	=	115.63	(76)
East	0.9x	0.77	x	1.66	x	113.09	x	0.63	x	0.7	=	57.37	(76)
East	0.9x	0.77	x	6.18	x	113.09	x	0.63	x	0.7	=	213.6	(76)
East	0.9x	0.77	x	4.1	x	113.09	x	0.63	x	0.7	=	141.71	(76)
East	0.9x	0.77	x	1.66	x	115.77	x	0.63	x	0.7	=	58.73	(76)
East	0.9x	0.77	x	6.18	x	115.77	x	0.63	x	0.7	=	218.65	(76)
East	0.9x	0.77	x	4.1	x	115.77	x	0.63	x	0.7	=	145.06	(76)
East	0.9x	0.77	x	1.66	x	110.22	x	0.63	x	0.7	=	55.92	(76)
East	0.9x	0.77	x	6.18	x	110.22	x	0.63	x	0.7	=	208.17	(76)
East	0.9x	0.77	x	4.1	x	110.22	x	0.63	x	0.7	=	138.1	(76)
East	0.9x	0.77	x	1.66	x	94.68	x	0.63	x	0.7	=	48.03	(76)
East	0.9x	0.77	x	6.18	x	94.68	x	0.63	x	0.7	=	178.81	(76)
East	0.9x	0.77	x	4.1	x	94.68	x	0.63	x	0.7	=	118.63	(76)
East	0.9x	0.77	x	1.66	x	73.59	x	0.63	x	0.7	=	37.33	(76)
East	0.9x	0.77	x	6.18	x	73.59	x	0.63	x	0.7	=	138.99	(76)
East	0.9x	0.77	x	4.1	x	73.59	x	0.63	x	0.7	=	92.21	(76)
East	0.9x	0.77	x	1.66	x	45.59	x	0.63	x	0.7	=	23.13	(76)
East	0.9x	0.77	x	6.18	x	45.59	x	0.63	x	0.7	=	86.1	(76)
East	0.9x	0.77	x	4.1	x	45.59	x	0.63	x	0.7	=	57.12	(76)
East	0.9x	0.77	x	1.66	x	24.49	x	0.63	x	0.7	=	12.42	(76)
East	0.9x	0.77	x	6.18	x	24.49	x	0.63	x	0.7	=	46.25	(76)
East	0.9x	0.77	x	4.1	x	24.49	x	0.63	x	0.7	=	30.69	(76)
East	0.9x	0.77	x	1.66	x	16.15	x	0.63	x	0.7	=	8.19	(76)
East	0.9x	0.77	x	6.18	x	16.15	x	0.63	x	0.7	=	30.5	(76)
East	0.9x	0.77	x	4.1	x	16.15	x	0.63	x	0.7	=	20.24	(76)
West	0.9x	0.77	x	1.67	x	19.64	x	0.63	x	0.7	=	10.02	(80)
West	0.9x	0.77	x	2.24	x	19.64	x	0.63	x	0.7	=	13.45	(80)
West	0.9x	0.77	x	1.5	x	19.64	x	0.63	x	0.7	=	9	(80)
West	0.9x	0.77	x	1.67	x	38.42	x	0.63	x	0.7	=	19.61	(80)
West	0.9x	0.77	x	2.24	x	38.42	x	0.63	x	0.7	=	26.3	(80)
West	0.9x	0.77	x	1.5	x	38.42	x	0.63	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	1.67	x	63.27	x	0.63	x	0.7	=	32.29	(80)
West	0.9x	0.77	x	2.24	x	63.27	x	0.63	x	0.7	=	43.32	(80)
West	0.9x	0.77	x	1.5	x	63.27	x	0.63	x	0.7	=	29.01	(80)
West	0.9x	0.77	x	1.67	x	92.28	x	0.63	x	0.7	=	47.1	(80)

West	0.9x	0.77	x	2.24	x	92.28	x	0.63	x	0.7	=	63.17	(80)
West	0.9x	0.77	x	1.5	x	92.28	x	0.63	x	0.7	=	42.3	(80)
West	0.9x	0.77	x	1.67	x	113.09	x	0.63	x	0.7	=	57.72	(80)
West	0.9x	0.77	x	2.24	x	113.09	x	0.63	x	0.7	=	77.42	(80)
West	0.9x	0.77	x	1.5	x	113.09	x	0.63	x	0.7	=	51.84	(80)
West	0.9x	0.77	x	1.67	x	115.77	x	0.63	x	0.7	=	59.09	(80)
West	0.9x	0.77	x	2.24	x	115.77	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	1.5	x	115.77	x	0.63	x	0.7	=	53.07	(80)
West	0.9x	0.77	x	1.67	x	110.22	x	0.63	x	0.7	=	56.25	(80)
West	0.9x	0.77	x	2.24	x	110.22	x	0.63	x	0.7	=	75.45	(80)
West	0.9x	0.77	x	1.5	x	110.22	x	0.63	x	0.7	=	50.53	(80)
West	0.9x	0.77	x	1.67	x	94.68	x	0.63	x	0.7	=	48.32	(80)
West	0.9x	0.77	x	2.24	x	94.68	x	0.63	x	0.7	=	64.81	(80)
West	0.9x	0.77	x	1.5	x	94.68	x	0.63	x	0.7	=	43.4	(80)
West	0.9x	0.77	x	1.67	x	73.59	x	0.63	x	0.7	=	37.56	(80)
West	0.9x	0.77	x	2.24	x	73.59	x	0.63	x	0.7	=	50.38	(80)
West	0.9x	0.77	x	1.5	x	73.59	x	0.63	x	0.7	=	33.73	(80)
West	0.9x	0.77	x	1.67	x	45.59	x	0.63	x	0.7	=	23.27	(80)
West	0.9x	0.77	x	2.24	x	45.59	x	0.63	x	0.7	=	31.21	(80)
West	0.9x	0.77	x	1.5	x	45.59	x	0.63	x	0.7	=	20.9	(80)
West	0.9x	0.77	x	1.67	x	24.49	x	0.63	x	0.7	=	12.5	(80)
West	0.9x	0.77	x	2.24	x	24.49	x	0.63	x	0.7	=	16.76	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.63	x	0.7	=	11.23	(80)
West	0.9x	0.77	x	1.67	x	16.15	x	0.63	x	0.7	=	8.24	(80)
West	0.9x	0.77	x	2.24	x	16.15	x	0.63	x	0.7	=	11.06	(80)
West	0.9x	0.77	x	1.5	x	16.15	x	0.63	x	0.7	=	7.4	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	104.14	203.72	335.5	489.3	599.66	613.86	584.42	502.01	390.2	241.73	129.85	85.64	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	509.06	606.64	725.54	858.56	947.84	941.67	898.95	822.32	721.14	593.67	505.93	479.79	(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	0.96	0.85	0.66	0.47	0.34	0.39	0.65	0.93	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.1	20.28	20.56	20.84	20.97	21	21	21	20.98	20.77	20.37	20.07	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.12	20.12	20.12	20.13	20.14	20.15	20.15	20.15	20.14	20.14	20.13	20.13	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.95	0.82	0.61	0.41	0.27	0.32	0.57	0.9	0.99	1	(89)

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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.91	19.18	19.58	19.97	20.11	20.15	20.15	20.15	20.13	19.88	19.33	18.88	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.33	19.56	19.92	20.27	20.41	20.44	20.45	20.45	20.43	20.19	19.69	19.3	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.33	19.56	19.92	20.27	20.41	20.44	20.45	20.45	20.43	20.19	19.69	19.3	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.94	0.82	0.63	0.43	0.3	0.34	0.6	0.9	0.98	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	505.73	596.15	685.4	708.27	595.45	403.8	266.58	279.65	431.82	536.95	498.07	477.47	(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=	1083.43	1053.6	961.01	801.93	612.42	405.25	266.71	279.93	441.15	674.28	890.72	1074.32	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	429.81	307.4	205.06	67.43	12.62	0	0	0	0	102.17	282.71	444.06	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1851.27 (98)

Space heating requirement in kWh/m²/year 24.65 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	429.81	307.4	205.06	67.43	12.62	0	0	0	0	102.17	282.71	444.06	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	459.69	328.77	219.31	72.12	13.5	0	0	0	0	109.28	302.36	474.93	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1979.97 (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)

193.95	170.96	179.58	161.03	157.84	141.09	135.55	148.67	148.39	166.98	176.5	189.3

Efficiency of water heater 79.8 (216)

(217)m=	86.88	86.36	85.17	82.69	80.5	79.8	79.8	79.8	79.8	83.55	86.06	87.01	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	223.24	197.96	210.85	194.75	196.07	176.8	169.86	186.31	185.95	199.86	205.08	217.55

Total = $Sum(219a)_{1...12}$ = 2364.29 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1979.97	
Water heating fuel used			2364.29	
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			328.89	(232)

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	=	427.67	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	510.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =			938.36	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	170.7	(268)
Total CO2, kg/year		sum of (265)…(271) =		1147.98	(272)

TER = 22.16 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:37:47

Project Information:

Assessed By:	John Simpson (STRO006273)	**Building Type:**	Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 80m²	
Site Reference :	Maitland Park Estate	**Plot Reference:**	AC 107
Address :	AC 107, Aspen Court, Maitland Park Estate, London, NW3 2EH		

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	22.83 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	5.23 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	35.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: West	1.87m²	
Windows facing: North	2.24m²	
Windows facing: North	9.83m²	
Windows facing: West	1.5m²	
Windows facing: West	1.5m²	
Windows facing: West	2.71m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features

Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 107

Address : AC 107, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	80	(1a) x	2.6	(2a) =	208	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	80	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	208	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(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

0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			1.87	x1/[1/(1.4)+ 0.04] =	2.48			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 3			9.83	x1/[1/(1.4)+ 0.04] =	13.03			(27)
Windows Type 4			1.5	x1/[1/(1.4)+ 0.04] =	1.99			(27)
Windows Type 5			1.5	x1/[1/(1.4)+ 0.04] =	1.99			(27)
Windows Type 6			2.71	x1/[1/(1.4)+ 0.04] =	3.59			(27)
Walls	48.85	19.65	29.2	x 0.12 =	3.5			(29)
Total area of elements, m²			48.85					(31)
Party wall			44.62	x 0 =	0			(32)

** 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) = 29.56 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 7.62 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 37.18 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	15.5	15.36	15.21	14.48	14.34	13.61	13.61	13.46	13.9	14.34	14.63	14.92	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	52.68	52.53	52.39	51.66	51.51	50.78	50.78	50.64	51.08	51.51	51.8	52.1	

Average = $Sum(39)_{1…12}$ /12= 51.62 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.66	0.66	0.65	0.65	0.64	0.63	0.63	0.63	0.64	0.64	0.65	0.65	

Average = Sum(40)1…12 /12= 0.65 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.46 (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 — 92.69 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	101.96	98.25	94.55	90.84	87.13	83.42	83.42	87.13	90.84	94.55	98.25	101.96	

Total = Sum(44)1…12 = 1112.32 (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=	151.21	132.25	136.47	118.97	114.16	98.51	91.28	104.75	106	123.53	134.85	146.44	

Total = Sum(45)1…12 = 1458.42 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.68	19.84	20.47	17.85	17.12	14.78	13.69	15.71	15.9	18.53	20.23	21.97	(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) = — 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a — 1.03 (52)

Temperature factor from Table 2b — 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = — 1.03 (54)

Enter (50) or (54) in (55) — 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	206.48	182.17	191.74	172.47	169.44	152	146.56	160.03	159.5	178.81	188.34	201.71	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	206.48	182.17	191.74	172.47	169.44	152	146.56	160.03	159.5	178.81	188.34	201.71	

Output from water heater (annual)$_{1...12}$ 2109.26 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	94.5	83.91	89.6	82.35	82.18	75.55	74.57	79.05	78.04	85.3	87.63	92.91	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	19.56	17.38	14.13	10.7	8	6.75	7.3	9.48	12.73	16.16	18.86	20.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	219.44	221.72	215.98	203.76	188.34	173.85	164.17	161.89	167.63	179.84	195.27	209.76	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	(71)

Water heating gains (Table 5)

(72)m=	127.01	124.87	120.43	114.38	110.46	104.93	100.23	106.25	108.39	114.65	121.71	124.88	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	425.96	423.91	410.48	388.79	366.74	345.47	331.64	337.57	348.69	370.59	395.78	414.69	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.24	x	10.63	x	0.4	x	0.8	=	5.28	(74)
North	0.9x	0.77	x	9.83	x	10.63	x	0.4	x	0.8	=	23.18	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.4	x	0.8	=	10.09	(74)
North	0.9x	0.77	x	9.83	x	20.32	x	0.4	x	0.8	=	44.3	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.4	x	0.8	=	17.15	(74)

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North	0.9x	0.77	x	9.83	x	34.53	x	0.4	x	0.8	=	75.27	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(74)
North	0.9x	0.77	x	9.83	x	55.46	x	0.4	x	0.8	=	120.91	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	x	9.83	x	74.72	x	0.4	x	0.8	=	162.87	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	9.83	x	79.99	x	0.4	x	0.8	=	174.36	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	9.83	x	74.68	x	0.4	x	0.8	=	162.79	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	9.83	x	59.25	x	0.4	x	0.8	=	129.15	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	x	9.83	x	41.52	x	0.4	x	0.8	=	90.5	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	x	9.83	x	24.19	x	0.4	x	0.8	=	52.73	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	x	9.83	x	13.12	x	0.4	x	0.8	=	28.6	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	x	9.83	x	8.86	x	0.4	x	0.8	=	19.32	(74)
West	0.9x	0.77	x	1.87	x	19.64	x	0.4	x	0.8	=	8.14	(80)
West	0.9x	0.77	x	1.5	x	19.64	x	0.4	x	0.8	=	6.53	(80)
West	0.9x	0.77	x	1.5	x	19.64	x	0.4	x	0.8	=	6.53	(80)
West	0.9x	0.77	x	2.71	x	19.64	x	0.4	x	0.8	=	11.8	(80)
West	0.9x	0.77	x	1.87	x	38.42	x	0.4	x	0.8	=	15.93	(80)
West	0.9x	0.77	x	1.5	x	38.42	x	0.4	x	0.8	=	12.78	(80)
West	0.9x	0.77	x	1.5	x	38.42	x	0.4	x	0.8	=	12.78	(80)
West	0.9x	0.77	x	2.71	x	38.42	x	0.4	x	0.8	=	23.09	(80)
West	0.9x	0.77	x	1.87	x	63.27	x	0.4	x	0.8	=	26.24	(80)
West	0.9x	0.77	x	1.5	x	63.27	x	0.4	x	0.8	=	21.05	(80)
West	0.9x	0.77	x	1.5	x	63.27	x	0.4	x	0.8	=	21.05	(80)
West	0.9x	0.77	x	2.71	x	63.27	x	0.4	x	0.8	=	38.03	(80)
West	0.9x	0.77	x	1.87	x	92.28	x	0.4	x	0.8	=	38.27	(80)
West	0.9x	0.77	x	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(80)
West	0.9x	0.77	x	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(80)
West	0.9x	0.77	x	2.71	x	92.28	x	0.4	x	0.8	=	55.46	(80)
West	0.9x	0.77	x	1.87	x	113.09	x	0.4	x	0.8	=	46.9	(80)
West	0.9x	0.77	x	1.5	x	113.09	x	0.4	x	0.8	=	37.62	(80)
West	0.9x	0.77	x	1.5	x	113.09	x	0.4	x	0.8	=	37.62	(80)
West	0.9x	0.77	x	2.71	x	113.09	x	0.4	x	0.8	=	67.97	(80)
West	0.9x	0.77	x	1.87	x	115.77	x	0.4	x	0.8	=	48.01	(80)
West	0.9x	0.77	x	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(80)

West	0.9x	0.77	x	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(80)
West	0.9x	0.77	x	2.71	x	115.77	x	0.4	x	0.8	=	69.57	(80)
West	0.9x	0.77	x	1.87	x	110.22	x	0.4	x	0.8	=	45.71	(80)
West	0.9x	0.77	x	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(80)
West	0.9x	0.77	x	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(80)
West	0.9x	0.77	x	2.71	x	110.22	x	0.4	x	0.8	=	66.24	(80)
West	0.9x	0.77	x	1.87	x	94.68	x	0.4	x	0.8	=	39.26	(80)
West	0.9x	0.77	x	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(80)
West	0.9x	0.77	x	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(80)
West	0.9x	0.77	x	2.71	x	94.68	x	0.4	x	0.8	=	56.9	(80)
West	0.9x	0.77	x	1.87	x	73.59	x	0.4	x	0.8	=	30.52	(80)
West	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(80)
West	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(80)
West	0.9x	0.77	x	2.71	x	73.59	x	0.4	x	0.8	=	44.22	(80)
West	0.9x	0.77	x	1.87	x	45.59	x	0.4	x	0.8	=	18.91	(80)
West	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(80)
West	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(80)
West	0.9x	0.77	x	2.71	x	45.59	x	0.4	x	0.8	=	27.4	(80)
West	0.9x	0.77	x	1.87	x	24.49	x	0.4	x	0.8	=	10.16	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(80)
West	0.9x	0.77	x	2.71	x	24.49	x	0.4	x	0.8	=	14.72	(80)
West	0.9x	0.77	x	1.87	x	16.15	x	0.4	x	0.8	=	6.7	(80)
West	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	=	5.37	(80)
West	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	=	5.37	(80)
West	0.9x	0.77	x	2.71	x	16.15	x	0.4	x	0.8	=	9.71	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	61.48	118.97	198.78	303.58	390.09	408.7	385.15	317.73	234.82	141.38	76.28	50.88	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	487.44	542.88	609.26	692.36	756.83	754.17	716.79	655.29	583.51	511.97	472.06	465.57	(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	0.96	0.84	0.63	0.43	0.31	0.36	0.6	0.91	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.49	20.6	20.78	20.94	20.99	21	21	21	21	20.91	20.67	20.47	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.38	20.38	20.38	20.39	20.39	20.4	20.4	20.4	20.4	20.39	20.39	20.38	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.95	0.81	0.59	0.39	0.27	0.31	0.55	0.88	0.98	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.69	19.86	20.1	20.33	20.39	20.4	20.4	20.4	20.39	20.29	19.96	19.67	(90)

fLA = Living area ÷ (4) = 0.43 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.03	20.17	20.39	20.59	20.65	20.65	20.66	20.66	20.65	20.56	20.27	20.01	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.03	20.17	20.39	20.59	20.65	20.65	20.66	20.66	20.65	20.56	20.27	20.01	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.95	0.82	0.6	0.41	0.29	0.33	0.57	0.89	0.98	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	484.59	535.1	579.7	568.58	457.67	307.38	205.92	215.5	333.12	456.66	464.56	463.57	(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=	828.86	802.37	727.62	603.94	460.8	307.49	205.93	215.51	334.58	512.86	682.08	823.58	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	256.14	179.61	110.05	25.46	2.33	0	0	0	0	41.81	156.62	267.85	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1039.87 (98)

Space heating requirement in kWh/m²/year 13 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1039.87	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1143.86	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 2109.26

If DHW from community scheme:

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Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2320.19	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	34.64	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		168.12	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	168.12	(331)
Energy for lighting (calculated in Appendix L)		345.49	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-827.35	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	563.59	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	17.98	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	581.56	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				581.56	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	87.25	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	179.31	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-429.39	(380)
Total CO2, kg/year	sum of (376)…(382) =				418.73	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				5.23	(384)
EI rating (section 14)					95.51	(385)

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User Details:

Assessor Name: John Simpson
Stroma Number: STRO006273
Software Name: Stroma FSAP 2012
Software Version: Version: 1.0.4.26

Property Address: AC 107

Address : AC 107, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	80	(1a) x	2.6	(2a) =	208	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	80	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	208	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.14	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.39

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			1.87	x1/[1/(1.4)+ 0.04]	=	2.48			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 3			9.83	x1/[1/(1.4)+ 0.04]	=	13.03			(27)
Windows Type 4			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 5			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 6			2.71	x1/[1/(1.4)+ 0.04]	=	3.59			(27)
Walls	48.85	19.65	29.2	x 0.18	=	5.26			(29)
Total area of elements, m²			48.85						(31)
Party wall			44.62	x 0	=	0			(32)

** 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) = 31.31 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.55 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	40.58	40.34	40.1	38.98	38.77	37.8	37.8	37.62	38.17	38.77	39.2	39.64	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	77.13	76.89	76.65	75.53	75.32	74.35	74.35	74.17	74.72	75.32	75.75	76.19	

Average = Sum(39)$_{1…12}$ /12= 75.53 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.96	0.96	0.96	0.94	0.94	0.93	0.93	0.93	0.93	0.94	0.95	0.95

Average = Sum(40)$_{1…12}$ /12= 0.94 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.46 (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 92.69 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	101.96	98.25	94.55	90.84	87.13	83.42	83.42	87.13	90.84	94.55	98.25	101.96	
									Total = Sum(44)$_{1…12}$ =			1112.32	(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=	151.21	132.25	136.47	118.97	114.16	98.51	91.28	104.75	106	123.53	134.85	146.44	
									Total = Sum(45)$_{1…12}$ =			1458.42	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	22.68	19.84	20.47	17.85	17.12	14.78	13.69	15.71	15.9	18.53	20.23	21.97	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.8	174.33	183.06	164.07	160.75	143.6	137.88	151.35	151.09	170.13	179.94	193.03	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.8	174.33	183.06	164.07	160.75	143.6	137.88	151.35	151.09	170.13	179.94	193.03	

Output from water heater (annual)1…12 2007.04 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	87.55	77.64	82.65	75.63	75.23	68.83	67.63	72.11	71.32	78.35	80.91	85.97	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	123.14	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	19.56	17.38	14.13	10.7	8	6.75	7.3	9.48	12.73	16.16	18.86	20.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	219.44	221.72	215.98	203.76	188.34	173.85	164.17	161.89	167.63	179.84	195.27	209.76	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	35.31	(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=	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	-98.51	(71)

Water heating gains (Table 5)

(72)m=	117.68	115.54	111.09	105.05	101.12	95.59	90.9	96.92	99.05	105.31	112.38	115.55	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	419.62	417.57	404.14	382.45	360.4	339.14	325.3	331.23	342.35	364.26	389.44	408.35	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.24	x	10.63	x	0.63	x	0.7	=	7.28	(74)
North	0.9x	0.77	x	9.83	x	10.63	x	0.63	x	0.7	=	31.94	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.63	x	0.7	=	13.91	(74)
North	0.9x	0.77	x	9.83	x	20.32	x	0.63	x	0.7	=	61.05	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.63	x	0.7	=	23.64	(74)

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North	0.9x	0.77	x	9.83	x	34.53	x	0.63	x	0.7	=	103.73	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.63	x	0.7	=	37.97	(74)
North	0.9x	0.77	x	9.83	x	55.46	x	0.63	x	0.7	=	166.62	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.63	x	0.7	=	51.15	(74)
North	0.9x	0.77	x	9.83	x	74.72	x	0.63	x	0.7	=	224.46	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.63	x	0.7	=	54.76	(74)
North	0.9x	0.77	x	9.83	x	79.99	x	0.63	x	0.7	=	240.29	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.63	x	0.7	=	51.12	(74)
North	0.9x	0.77	x	9.83	x	74.68	x	0.63	x	0.7	=	224.34	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.63	x	0.7	=	40.56	(74)
North	0.9x	0.77	x	9.83	x	59.25	x	0.63	x	0.7	=	177.99	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.63	x	0.7	=	28.42	(74)
North	0.9x	0.77	x	9.83	x	41.52	x	0.63	x	0.7	=	124.72	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.63	x	0.7	=	16.56	(74)
North	0.9x	0.77	x	9.83	x	24.19	x	0.63	x	0.7	=	72.67	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.63	x	0.7	=	8.98	(74)
North	0.9x	0.77	x	9.83	x	13.12	x	0.63	x	0.7	=	39.41	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.63	x	0.7	=	6.07	(74)
North	0.9x	0.77	x	9.83	x	8.86	x	0.63	x	0.7	=	26.63	(74)
West	0.9x	0.77	x	1.87	x	19.64	x	0.63	x	0.7	=	11.22	(80)
West	0.9x	0.77	x	1.5	x	19.64	x	0.63	x	0.7	=	9	(80)
West	0.9x	0.77	x	1.5	x	19.64	x	0.63	x	0.7	=	9	(80)
West	0.9x	0.77	x	2.71	x	19.64	x	0.63	x	0.7	=	16.27	(80)
West	0.9x	0.77	x	1.87	x	38.42	x	0.63	x	0.7	=	21.96	(80)
West	0.9x	0.77	x	1.5	x	38.42	x	0.63	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	1.5	x	38.42	x	0.63	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	2.71	x	38.42	x	0.63	x	0.7	=	31.82	(80)
West	0.9x	0.77	x	1.87	x	63.27	x	0.63	x	0.7	=	36.16	(80)
West	0.9x	0.77	x	1.5	x	63.27	x	0.63	x	0.7	=	29.01	(80)
West	0.9x	0.77	x	1.5	x	63.27	x	0.63	x	0.7	=	29.01	(80)
West	0.9x	0.77	x	2.71	x	63.27	x	0.63	x	0.7	=	52.4	(80)
West	0.9x	0.77	x	1.87	x	92.28	x	0.63	x	0.7	=	52.74	(80)
West	0.9x	0.77	x	1.5	x	92.28	x	0.63	x	0.7	=	42.3	(80)
West	0.9x	0.77	x	1.5	x	92.28	x	0.63	x	0.7	=	42.3	(80)
West	0.9x	0.77	x	2.71	x	92.28	x	0.63	x	0.7	=	76.43	(80)
West	0.9x	0.77	x	1.87	x	113.09	x	0.63	x	0.7	=	64.63	(80)
West	0.9x	0.77	x	1.5	x	113.09	x	0.63	x	0.7	=	51.84	(80)
West	0.9x	0.77	x	1.5	x	113.09	x	0.63	x	0.7	=	51.84	(80)
West	0.9x	0.77	x	2.71	x	113.09	x	0.63	x	0.7	=	93.66	(80)
West	0.9x	0.77	x	1.87	x	115.77	x	0.63	x	0.7	=	66.16	(80)
West	0.9x	0.77	x	1.5	x	115.77	x	0.63	x	0.7	=	53.07	(80)

West	0.9x	0.77	x	1.5	x	115.77	x	0.63	x	0.7	=	53.07	(80)
West	0.9x	0.77	x	2.71	x	115.77	x	0.63	x	0.7	=	95.88	(80)
West	0.9x	0.77	x	1.87	x	110.22	x	0.63	x	0.7	=	62.99	(80)
West	0.9x	0.77	x	1.5	x	110.22	x	0.63	x	0.7	=	50.53	(80)
West	0.9x	0.77	x	1.5	x	110.22	x	0.63	x	0.7	=	50.53	(80)
West	0.9x	0.77	x	2.71	x	110.22	x	0.63	x	0.7	=	91.28	(80)
West	0.9x	0.77	x	1.87	x	94.68	x	0.63	x	0.7	=	54.11	(80)
West	0.9x	0.77	x	1.5	x	94.68	x	0.63	x	0.7	=	43.4	(80)
West	0.9x	0.77	x	1.5	x	94.68	x	0.63	x	0.7	=	43.4	(80)
West	0.9x	0.77	x	2.71	x	94.68	x	0.63	x	0.7	=	78.41	(80)
West	0.9x	0.77	x	1.87	x	73.59	x	0.63	x	0.7	=	42.06	(80)
West	0.9x	0.77	x	1.5	x	73.59	x	0.63	x	0.7	=	33.73	(80)
West	0.9x	0.77	x	1.5	x	73.59	x	0.63	x	0.7	=	33.73	(80)
West	0.9x	0.77	x	2.71	x	73.59	x	0.63	x	0.7	=	60.95	(80)
West	0.9x	0.77	x	1.87	x	45.59	x	0.63	x	0.7	=	26.05	(80)
West	0.9x	0.77	x	1.5	x	45.59	x	0.63	x	0.7	=	20.9	(80)
West	0.9x	0.77	x	1.5	x	45.59	x	0.63	x	0.7	=	20.9	(80)
West	0.9x	0.77	x	2.71	x	45.59	x	0.63	x	0.7	=	37.76	(80)
West	0.9x	0.77	x	1.87	x	24.49	x	0.63	x	0.7	=	14	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.63	x	0.7	=	11.23	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.63	x	0.7	=	11.23	(80)
West	0.9x	0.77	x	2.71	x	24.49	x	0.63	x	0.7	=	20.28	(80)
West	0.9x	0.77	x	1.87	x	16.15	x	0.63	x	0.7	=	9.23	(80)
West	0.9x	0.77	x	1.5	x	16.15	x	0.63	x	0.7	=	7.4	(80)
West	0.9x	0.77	x	1.5	x	16.15	x	0.63	x	0.7	=	7.4	(80)
West	0.9x	0.77	x	2.71	x	16.15	x	0.63	x	0.7	=	13.38	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	84.72	163.96	273.95	418.37	537.59	563.23	530.79	437.87	323.62	194.84	105.12	70.11	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	504.35	581.53	678.09	800.82	898	902.37	856.09	769.1	665.97	559.1	494.56	478.47	(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	0.91	0.73	0.52	0.38	0.44	0.73	0.96	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.05	20.2	20.45	20.77	20.95	20.99	21	21	20.96	20.7	20.32	20.02	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.11	20.12	20.12	20.13	20.13	20.14	20.14	20.14	20.14	20.13	20.13	20.12	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.97	0.88	0.68	0.45	0.31	0.36	0.65	0.94	0.99	1	(89)

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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.84	19.06	19.43	19.87	20.09	20.14	20.14	20.14	20.11	19.79	19.24	18.81	(90)

fLA = Living area ÷ (4) = 0.43 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.35	19.54	19.87	20.25	20.45	20.5	20.51	20.51	20.47	20.17	19.7	19.33	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.35	19.54	19.87	20.25	20.45	20.5	20.51	20.51	20.47	20.17	19.7	19.33	(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	0.88	0.7	0.48	0.34	0.4	0.68	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	502.08	575.44	656.13	706.92	627.36	435.85	290.22	303.96	455.9	525.46	489.55	476.85	(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=	1161.04	1126	1024.6	857.62	659.28	438.9	290.52	304.68	476.3	721.21	954.35	1152.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	490.27	369.98	274.14	108.5	23.75	0	0	0	0	145.64	334.66	502.72	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2249.66 (98)

Space heating requirement in kWh/m²/year 28.12 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	490.27	369.98	274.14	108.5	23.75	0	0	0	0	145.64	334.66	502.72	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	524.36	395.7	293.2	116.05	25.4	0	0	0	0	155.76	357.92	537.67	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2406.05 (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)

197.8	174.33	183.06	164.07	160.75	143.6	137.88	151.35	151.09	170.13	179.94	193.03

Efficiency of water heater 79.8 (216)

TER WorkSheet: New dwelling design stage

(217)m=	87.14	86.77	85.89	83.74	81.03	79.8	79.8	79.8	79.8	84.4	86.45	87.25	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	226.99	200.91	213.14	195.92	198.38	179.95	172.78	189.66	189.34	201.57	208.15	221.23

Total = $\text{Sum}(219a)_{1...12}$ = 2398.01 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2406.05	
Water heating fuel used			2398.01	
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			345.49	(232)

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	=	519.71	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	517.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1037.68	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	179.31	(268)
Total CO2, kg/year		sum of (265)…(271) =		1255.91	(272)

TER = 22.83 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:37:59

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.1m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 108

Address : AC 108, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.49 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	6.24 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	35.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	31.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	4.1m²	
Windows facing: North	1.71m²	
Windows facing: North	6.18m²	
Windows facing: South	1.67m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features

Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 108

Address : AC 108, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1	(1a) x	2.6	(2a) =	135.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	135.46	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			4.1	x1/[1/(1.4)+ 0.04]	=	5.44			(27)
Windows Type 2			1.71	x1/[1/(1.4)+ 0.04]	=	2.27			(27)
Windows Type 3			6.18	x1/[1/(1.4)+ 0.04]	=	8.19			(27)
Windows Type 4			1.67	x1/[1/(1.4)+ 0.04]	=	2.21			(27)
Walls	31.1	13.66	17.44	x 0.12	=	2.09			(29)
Total area of elements, m²			31.1						(31)
Party wall			44.62	x 0	=	0			(32)

** 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) = 20.2 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.43 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.63 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	10.1	10	9.91	9.43	9.34	8.86	8.86	8.77	9.05	9.34	9.53	9.72	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	35.73	35.63	35.54	35.06	34.97	34.49	34.49	34.4	34.68	34.97	35.16	35.35	

Average = Sum(39)$_{1…12}$ /12= 35.04 (39)

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Heat loss parameter (HLP), W/m²K   (40)m = (39)m ÷ (4)

(40)m=	0.69	0.68	0.68	0.67	0.67	0.66	0.66	0.66	0.67	0.67	0.67	0.68

Average = Sum(40)$_{1…12}$ /12= 0.67 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.75 (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 75.81 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39	
										Total = Sum(44)$_{1…12}$ =		909.73	(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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77	
										Total = Sum(45)$_{1…12}$ =		1192.79	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96	(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) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	178.94	158.09	166.89	150.8	148.64	134.06	129.94	140.95	140.19	156.31	163.78	175.04	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	178.94	158.09	166.89	150.8	148.64	134.06	129.94	140.95	140.19	156.31	163.78	175.04	

Output from water heater (annual)$_{1...12}$ 1843.63 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	85.34	75.91	81.33	75.15	75.27	69.58	69.05	72.71	71.62	77.82	79.47	84.04	(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):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m=	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	13.61	12.09	9.83	7.44	5.56	4.7	5.08	6.6	8.86	11.24	13.12	13.99	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	152.69	154.27	150.28	141.78	131.05	120.96	114.23	112.64	116.63	125.13	135.86	145.95	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	(69)
Pumps and fans gains (Table 5a)													
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)
Water heating gains (Table 5)													
(72)m=	114.71	112.95	109.32	104.37	101.16	96.64	92.8	97.72	99.47	104.59	110.37	112.96	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	330.28	328.59	318.71	302.87	287.06	271.59	261.39	266.25	274.24	290.25	308.64	322.18	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.71	x	10.63	x	0.4	x	0.8	=	4.03	(74)
North	0.9x	0.77	x	6.18	x	10.63	x	0.4	x	0.8	=	14.57	(74)
North	0.9x	0.77	x	1.71	x	20.32	x	0.4	x	0.8	=	7.71	(74)
North	0.9x	0.77	x	6.18	x	20.32	x	0.4	x	0.8	=	27.85	(74)
North	0.9x	0.77	x	1.71	x	34.53	x	0.4	x	0.8	=	13.09	(74)

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North	0.9x	0.77	x	6.18	x	34.53	x	0.4	x	0.8	=	47.32	(74)
North	0.9x	0.77	x	1.71	x	55.46	x	0.4	x	0.8	=	21.03	(74)
North	0.9x	0.77	x	6.18	x	55.46	x	0.4	x	0.8	=	76.01	(74)
North	0.9x	0.77	x	1.71	x	74.72	x	0.4	x	0.8	=	28.33	(74)
North	0.9x	0.77	x	6.18	x	74.72	x	0.4	x	0.8	=	102.4	(74)
North	0.9x	0.77	x	1.71	x	79.99	x	0.4	x	0.8	=	30.33	(74)
North	0.9x	0.77	x	6.18	x	79.99	x	0.4	x	0.8	=	109.62	(74)
North	0.9x	0.77	x	1.71	x	74.68	x	0.4	x	0.8	=	28.32	(74)
North	0.9x	0.77	x	6.18	x	74.68	x	0.4	x	0.8	=	102.34	(74)
North	0.9x	0.77	x	1.71	x	59.25	x	0.4	x	0.8	=	22.47	(74)
North	0.9x	0.77	x	6.18	x	59.25	x	0.4	x	0.8	=	81.2	(74)
North	0.9x	0.77	x	1.71	x	41.52	x	0.4	x	0.8	=	15.74	(74)
North	0.9x	0.77	x	6.18	x	41.52	x	0.4	x	0.8	=	56.9	(74)
North	0.9x	0.77	x	1.71	x	24.19	x	0.4	x	0.8	=	9.17	(74)
North	0.9x	0.77	x	6.18	x	24.19	x	0.4	x	0.8	=	33.15	(74)
North	0.9x	0.77	x	1.71	x	13.12	x	0.4	x	0.8	=	4.97	(74)
North	0.9x	0.77	x	6.18	x	13.12	x	0.4	x	0.8	=	17.98	(74)
North	0.9x	0.77	x	1.71	x	8.86	x	0.4	x	0.8	=	3.36	(74)
North	0.9x	0.77	x	6.18	x	8.86	x	0.4	x	0.8	=	12.15	(74)
South	0.9x	0.77	x	4.1	x	46.75	x	0.4	x	0.8	=	42.51	(78)
South	0.9x	0.77	x	1.67	x	46.75	x	0.4	x	0.8	=	17.31	(78)
South	0.9x	0.77	x	4.1	x	76.57	x	0.4	x	0.8	=	69.62	(78)
South	0.9x	0.77	x	1.67	x	76.57	x	0.4	x	0.8	=	28.36	(78)
South	0.9x	0.77	x	4.1	x	97.53	x	0.4	x	0.8	=	88.68	(78)
South	0.9x	0.77	x	1.67	x	97.53	x	0.4	x	0.8	=	36.12	(78)
South	0.9x	0.77	x	4.1	x	110.23	x	0.4	x	0.8	=	100.23	(78)
South	0.9x	0.77	x	1.67	x	110.23	x	0.4	x	0.8	=	40.82	(78)
South	0.9x	0.77	x	4.1	x	114.87	x	0.4	x	0.8	=	104.44	(78)
South	0.9x	0.77	x	1.67	x	114.87	x	0.4	x	0.8	=	42.54	(78)
South	0.9x	0.77	x	4.1	x	110.55	x	0.4	x	0.8	=	100.51	(78)
South	0.9x	0.77	x	1.67	x	110.55	x	0.4	x	0.8	=	40.94	(78)
South	0.9x	0.77	x	4.1	x	108.01	x	0.4	x	0.8	=	98.21	(78)
South	0.9x	0.77	x	1.67	x	108.01	x	0.4	x	0.8	=	40	(78)
South	0.9x	0.77	x	4.1	x	104.89	x	0.4	x	0.8	=	95.37	(78)
South	0.9x	0.77	x	1.67	x	104.89	x	0.4	x	0.8	=	38.85	(78)
South	0.9x	0.77	x	4.1	x	101.89	x	0.4	x	0.8	=	92.64	(78)
South	0.9x	0.77	x	1.67	x	101.89	x	0.4	x	0.8	=	37.73	(78)
South	0.9x	0.77	x	4.1	x	82.59	x	0.4	x	0.8	=	75.09	(78)
South	0.9x	0.77	x	1.67	x	82.59	x	0.4	x	0.8	=	30.58	(78)
South	0.9x	0.77	x	4.1	x	55.42	x	0.4	x	0.8	=	50.39	(78)
South	0.9x	0.77	x	1.67	x	55.42	x	0.4	x	0.8	=	20.52	(78)

South	0.9x	0.77	x	4.1	x	40.4	x	0.4	x	0.8	=	36.73	(78)
South	0.9x	0.77	x	1.67	x	40.4	x	0.4	x	0.8	=	14.96	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	78.43	133.53	185.22	238.1	277.71	281.4	268.87	237.88	203.01	148	93.86	67.2	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	408.71	462.12	503.92	540.97	564.77	552.99	530.25	504.13	477.25	438.25	402.5	389.38	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.9	0.76	0.57	0.4	0.29	0.31	0.5	0.79	0.95	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.62	20.74	20.87	20.97	21	21	21	21	21	20.97	20.79	20.59	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.35	20.36	20.36	20.36	20.37	20.37	20.37	20.38	20.37	20.37	20.36	20.36	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.95	0.88	0.72	0.53	0.36	0.25	0.27	0.46	0.75	0.94	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.85	20.03	20.21	20.33	20.36	20.37	20.37	20.38	20.37	20.33	20.11	19.82	(90)

fLA = Living area ÷ (4) = 0.51 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.24	20.39	20.55	20.66	20.69	20.69	20.69	20.69	20.69	20.65	20.46	20.21	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.24	20.39	20.55	20.66	20.69	20.69	20.69	20.69	20.69	20.65	20.46	20.21	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.95	0.88	0.74	0.55	0.38	0.27	0.29	0.48	0.77	0.94	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	399.38	438.17	444.46	399.59	312.84	210.1	141.17	147.68	228.23	337.38	379.53	382.61	(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=	569.53	552.02	499.22	412.25	314.21	210.15	141.17	147.69	228.57	351.58	469.62	565.87	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	126.59	76.51	40.74	9.12	1.02	0	0	0	0	10.57	64.87	136.34	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 465.76 (98)

Space heating requirement in kWh/m²/year 8.94 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

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Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		465.76	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	512.33	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		1843.63	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2028	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	25.4	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		103.29	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	103.29	(331)
Energy for lighting (calculated in Appendix L)		240.39	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-538.9	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	413.3	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	13.18	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	426.49	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)

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Total CO2 associated with space and water heating	(373) + (374) + (375) =			426.49	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	53.61	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	124.76	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-279.69	(380)
Total CO2, kg/year	sum of (376)…(382) =			325.17	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			6.24	(384)
EI rating (section 14)				95.51	(385)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 108

Address : AC 108, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1	(1a) x	2.6	(2a) =	135.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	135.46	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.15	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			3.91	x1/[1/(1.4)+ 0.04] =	5.18			(27)
Windows Type 2			1.63	x1/[1/(1.4)+ 0.04] =	2.16			(27)
Windows Type 3			5.89	x1/[1/(1.4)+ 0.04] =	7.81			(27)
Windows Type 4			1.59	x1/[1/(1.4)+ 0.04] =	2.11			(27)
Walls	31.1	13.02	18.08	x 0.18 =	3.25			(29)
Total area of elements, m²			31.1					(31)
Party wall			44.62	x 0 =	0			(32)

** 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) = 20.52 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.74 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 24.26 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.5	26.34	26.18	25.44	25.3	24.66	24.66	24.54	24.9	25.3	25.58	25.88	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	50.76	50.6	50.44	49.7	49.56	48.91	48.91	48.79	49.16	49.56	49.84	50.14	

Average = Sum(39)$_{1…12}$ /12= 49.7 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.97	0.97	0.97	0.95	0.95	0.94	0.94	0.94	0.94	0.95	0.96	0.96

Average = Sum(40)1…12 /12= 0.95 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.75 (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 75.81 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)1…12 = 909.73 (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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77

Total = Sum(45)1…12 = 1192.79 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	170.26	150.25	158.21	142.4	139.96	125.66	121.25	132.27	131.79	147.63	155.38	166.36	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	170.26	150.25	158.21	142.4	139.96	125.66	121.25	132.27	131.79	147.63	155.38	166.36	

Output from water heater (annual)$_{1...12}$ 1741.41 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	78.4	69.63	74.39	68.43	68.32	62.86	62.1	65.76	64.9	70.87	72.74	77.1	(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=	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.61	12.09	9.83	7.44	5.56	4.7	5.08	6.6	8.86	11.24	13.12	13.99	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	152.69	154.27	150.28	141.78	131.05	120.96	114.23	112.64	116.63	125.13	135.86	145.95	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	(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=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)

Water heating gains (Table 5)

(72)m=	105.37	103.62	99.98	95.04	91.83	87.31	83.47	88.39	90.14	95.26	101.03	103.63	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	323.95	322.26	312.37	296.54	280.72	265.25	255.05	259.91	267.91	283.91	302.3	315.85	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.63	x	10.63	x	0.63	x	0.7	=	5.3	(74)
North	0.9x	0.77	x	5.89	x	10.63	x	0.63	x	0.7	=	19.14	(74)
North	0.9x	0.77	x	1.63	x	20.32	x	0.63	x	0.7	=	10.12	(74)
North	0.9x	0.77	x	5.89	x	20.32	x	0.63	x	0.7	=	36.58	(74)
North	0.9x	0.77	x	1.63	x	34.53	x	0.63	x	0.7	=	17.2	(74)

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North	0.9x	0.77	x	5.89	x	34.53	x	0.63	x	0.7	=	62.16	(74)
North	0.9x	0.77	x	1.63	x	55.46	x	0.63	x	0.7	=	27.63	(74)
North	0.9x	0.77	x	5.89	x	55.46	x	0.63	x	0.7	=	99.84	(74)
North	0.9x	0.77	x	1.63	x	74.72	x	0.63	x	0.7	=	37.22	(74)
North	0.9x	0.77	x	5.89	x	74.72	x	0.63	x	0.7	=	134.49	(74)
North	0.9x	0.77	x	1.63	x	79.99	x	0.63	x	0.7	=	39.84	(74)
North	0.9x	0.77	x	5.89	x	79.99	x	0.63	x	0.7	=	143.98	(74)
North	0.9x	0.77	x	1.63	x	74.68	x	0.63	x	0.7	=	37.2	(74)
North	0.9x	0.77	x	5.89	x	74.68	x	0.63	x	0.7	=	134.42	(74)
North	0.9x	0.77	x	1.63	x	59.25	x	0.63	x	0.7	=	29.51	(74)
North	0.9x	0.77	x	5.89	x	59.25	x	0.63	x	0.7	=	106.65	(74)
North	0.9x	0.77	x	1.63	x	41.52	x	0.63	x	0.7	=	20.68	(74)
North	0.9x	0.77	x	5.89	x	41.52	x	0.63	x	0.7	=	74.73	(74)
North	0.9x	0.77	x	1.63	x	24.19	x	0.63	x	0.7	=	12.05	(74)
North	0.9x	0.77	x	5.89	x	24.19	x	0.63	x	0.7	=	43.54	(74)
North	0.9x	0.77	x	1.63	x	13.12	x	0.63	x	0.7	=	6.53	(74)
North	0.9x	0.77	x	5.89	x	13.12	x	0.63	x	0.7	=	23.61	(74)
North	0.9x	0.77	x	1.63	x	8.86	x	0.63	x	0.7	=	4.42	(74)
North	0.9x	0.77	x	5.89	x	8.86	x	0.63	x	0.7	=	15.96	(74)
South	0.9x	0.77	x	3.91	x	46.75	x	0.63	x	0.7	=	55.87	(78)
South	0.9x	0.77	x	1.59	x	46.75	x	0.63	x	0.7	=	22.72	(78)
South	0.9x	0.77	x	3.91	x	76.57	x	0.63	x	0.7	=	91.49	(78)
South	0.9x	0.77	x	1.59	x	76.57	x	0.63	x	0.7	=	37.21	(78)
South	0.9x	0.77	x	3.91	x	97.53	x	0.63	x	0.7	=	116.55	(78)
South	0.9x	0.77	x	1.59	x	97.53	x	0.63	x	0.7	=	47.39	(78)
South	0.9x	0.77	x	3.91	x	110.23	x	0.63	x	0.7	=	131.72	(78)
South	0.9x	0.77	x	1.59	x	110.23	x	0.63	x	0.7	=	53.57	(78)
South	0.9x	0.77	x	3.91	x	114.87	x	0.63	x	0.7	=	137.26	(78)
South	0.9x	0.77	x	1.59	x	114.87	x	0.63	x	0.7	=	55.82	(78)
South	0.9x	0.77	x	3.91	x	110.55	x	0.63	x	0.7	=	132.1	(78)
South	0.9x	0.77	x	1.59	x	110.55	x	0.63	x	0.7	=	53.72	(78)
South	0.9x	0.77	x	3.91	x	108.01	x	0.63	x	0.7	=	129.07	(78)
South	0.9x	0.77	x	1.59	x	108.01	x	0.63	x	0.7	=	52.49	(78)
South	0.9x	0.77	x	3.91	x	104.89	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	0.77	x	1.59	x	104.89	x	0.63	x	0.7	=	50.97	(78)
South	0.9x	0.77	x	3.91	x	101.89	x	0.63	x	0.7	=	121.75	(78)
South	0.9x	0.77	x	1.59	x	101.89	x	0.63	x	0.7	=	49.51	(78)
South	0.9x	0.77	x	3.91	x	82.59	x	0.63	x	0.7	=	98.69	(78)
South	0.9x	0.77	x	1.59	x	82.59	x	0.63	x	0.7	=	40.13	(78)
South	0.9x	0.77	x	3.91	x	55.42	x	0.63	x	0.7	=	66.22	(78)
South	0.9x	0.77	x	1.59	x	55.42	x	0.63	x	0.7	=	26.93	(78)

South	0.9x	0.77	x	3.91	x	40.4	x	0.63	x	0.7	=	48.27	(78)
South	0.9x	0.77	x	1.59	x	40.4	x	0.63	x	0.7	=	19.63	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	103.02	175.4	243.3	312.76	364.8	369.64	353.18	312.47	266.67	194.41	123.3	88.28	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	426.97	497.66	555.67	609.3	645.52	634.89	608.23	572.38	534.58	478.32	425.6	404.12	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.85	0.68	0.49	0.35	0.39	0.62	0.88	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.21	20.39	20.61	20.84	20.96	21	21	21	20.98	20.83	20.48	20.18	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.1	20.11	20.11	20.12	20.12	20.13	20.13	20.14	20.13	20.12	20.12	20.11	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.93	0.81	0.63	0.42	0.28	0.32	0.55	0.85	0.97	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.07	19.32	19.64	19.95	20.09	20.13	20.13	20.14	20.12	19.94	19.47	19.03	(90)

fLA = Living area ÷ (4) = 0.51 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.65	19.87	20.13	20.41	20.53	20.57	20.57	20.58	20.56	20.39	19.99	19.61	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.65	19.87	20.13	20.41	20.53	20.57	20.57	20.58	20.56	20.39	19.99	19.61	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.97	0.93	0.83	0.65	0.46	0.32	0.36	0.58	0.86	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	420.79	481.56	515	503.05	422.31	290.49	194.25	203.44	311.42	411.6	411.78	399.61	(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=	779.05	757.24	687.77	571.8	437.83	292.08	194.41	203.72	317.54	485.34	642.26	772.7	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	266.55	185.25	128.54	49.5	11.55	0	0	0	0	54.86	165.94	277.58	

Total per year (kWh/year) = $\text{Sum}(98)_{1\ldots5,9\ldots12}$ = 1139.77 (98)

Space heating requirement in kWh/m²/year 21.88 (99)

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) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	266.55	185.25	128.54	49.5	11.55	0	0	0	0	54.86	165.94	277.58		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	285.08	198.13	137.48	52.94	12.35	0	0	0	0	58.67	177.48	296.87		(211)
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1219	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)	170.26	150.25	158.21	142.4	139.96	125.66	121.25	132.27	131.79	147.63	155.38	166.36		
Efficiency of water heater													79.8	(216)
(217)m=	86	85.37	84.27	82.31	80.53	79.8	79.8	79.8	79.8	82.44	84.99	86.17		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	197.97	175.99	187.75	173	173.81	157.47	151.95	165.75	165.15	179.07	182.82	193.06		
Total = Sum(219a)$_{1...12}$ =													2103.78	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1219	
Water heating fuel used		2103.78	
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		240.39	(232)

12a. CO_2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO_2/kWh		**Emissions** kg CO_2/year	
Space heating (main system 1)	(211)	x	0.216	=	263.3	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	454.42	(264)
Space and water heating	(261) + (262) + (263) + (264) =				717.72	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	124.76	(268)

TER WorkSheet: New dwelling design stage

Total CO2, kg/year	sum of (265)…(271) =	881.41	(272)
TER =		24.49	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:38:08

Project Information:

Assessed By:	John Simpson (STRO006273)	**Building Type:**	Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 77.6m²	
Site Reference :	Maitland Park Estate	**Plot Reference:**	AC 109
Address :	AC 109, Aspen Court, Maitland Park Estate, London, NW3 2EH		

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)		
Fuel factor: 1.55 (electricity (c))		
Target Carbon Dioxide Emission Rate (TER)	21.63 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	4.61 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	35.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	30.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North	2.24m²	
Windows facing: South	4.1m²	
Windows facing: North	6.18m²	
Windows facing: South	1.71m²	
Windows facing: North	1.71m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features	
Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 109

Address : AC 109, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	77.6	(1a) x	2.6	(2a) =	201.76	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	77.6	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		201.76	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 2			4.1	x1/[1/(1.4)+ 0.04] =	5.44			(27)
Windows Type 3			6.18	x1/[1/(1.4)+ 0.04] =	8.19			(27)
Windows Type 4			1.71	x1/[1/(1.4)+ 0.04] =	2.27			(27)
Windows Type 5			1.71	x1/[1/(1.4)+ 0.04] =	2.27			(27)
Walls	46.59	15.94	30.65	x 0.12 =	3.68			(29)
Total area of elements, m²			46.59					(31)
Party wall			44.62	x 0 =	0			(32)

** 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) = 24.81 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.9 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.71 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	15.04	14.9	14.76	14.05	13.91	13.2	13.2	13.06	13.48	13.91	14.19	14.47	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	46.75	46.61	46.47	45.76	45.62	44.91	44.91	44.77	45.19	45.62	45.9	46.18	

Average = Sum(39)1…12 /12= 45.72 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.6	0.6	0.6	0.59	0.59	0.58	0.58	0.58	0.58	0.59	0.59	0.6

Average = Sum(40)1…12 /12= 0.59 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.42 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.57 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	100.73	97.07	93.41	89.74	86.08	82.42	82.42	86.08	89.74	93.41	97.07	100.73

Total = Sum(44)1…12 = 1098.89 (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=	149.38	130.65	134.82	117.54	112.78	97.32	90.18	103.49	104.72	122.04	133.22	144.67

Total = Sum(45)1…12 = 1440.81 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.41	19.6	20.22	17.63	16.92	14.6	13.53	15.52	15.71	18.31	19.98	21.7	(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) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	204.66	180.58	190.1	171.03	168.06	150.82	145.46	158.76	158.22	177.32	186.71	199.94	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	204.66	180.58	190.1	171.03	168.06	150.82	145.46	158.76	158.22	177.32	186.71	199.94	

Output from water heater (annual)$_{1...12}$ 2091.65 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	93.89	83.38	89.05	81.88	81.72	75.15	74.21	78.63	77.62	84.8	87.09	92.32	(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=	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	19.11	16.97	13.8	10.45	7.81	6.59	7.13	9.26	12.43	15.79	18.42	19.64	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	214.35	216.58	210.97	199.04	183.98	169.82	160.36	158.14	163.74	175.67	190.74	204.89	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	(71)

Water heating gains (Table 5)

(72)m=	126.2	124.08	119.69	113.72	109.84	104.38	99.74	105.69	107.8	113.98	120.96	124.09	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	418.89	416.87	403.7	382.44	360.86	340.03	326.46	332.32	343.21	364.68	389.36	407.86	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.24	x	10.63	x	0.4	x	0.8	=	5.28	(74)
North	0.9x	0.77	x	6.18	x	10.63	x	0.4	x	0.8	=	14.57	(74)
North	0.9x	0.77	x	1.71	x	10.63	x	0.4	x	0.8	=	4.03	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.4	x	0.8	=	10.09	(74)
North	0.9x	0.77	x	6.18	x	20.32	x	0.4	x	0.8	=	27.85	(74)

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North	0.9x	0.77	x	1.71	x	20.32	x	0.4	x	0.8	=	7.71	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.4	x	0.8	=	17.15	(74)
North	0.9x	0.77	x	6.18	x	34.53	x	0.4	x	0.8	=	47.32	(74)
North	0.9x	0.77	x	1.71	x	34.53	x	0.4	x	0.8	=	13.09	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(74)
North	0.9x	0.77	x	6.18	x	55.46	x	0.4	x	0.8	=	76.01	(74)
North	0.9x	0.77	x	1.71	x	55.46	x	0.4	x	0.8	=	21.03	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	x	6.18	x	74.72	x	0.4	x	0.8	=	102.4	(74)
North	0.9x	0.77	x	1.71	x	74.72	x	0.4	x	0.8	=	28.33	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	6.18	x	79.99	x	0.4	x	0.8	=	109.62	(74)
North	0.9x	0.77	x	1.71	x	79.99	x	0.4	x	0.8	=	30.33	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	6.18	x	74.68	x	0.4	x	0.8	=	102.34	(74)
North	0.9x	0.77	x	1.71	x	74.68	x	0.4	x	0.8	=	28.32	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	6.18	x	59.25	x	0.4	x	0.8	=	81.2	(74)
North	0.9x	0.77	x	1.71	x	59.25	x	0.4	x	0.8	=	22.47	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	x	6.18	x	41.52	x	0.4	x	0.8	=	56.9	(74)
North	0.9x	0.77	x	1.71	x	41.52	x	0.4	x	0.8	=	15.74	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	x	6.18	x	24.19	x	0.4	x	0.8	=	33.15	(74)
North	0.9x	0.77	x	1.71	x	24.19	x	0.4	x	0.8	=	9.17	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	x	6.18	x	13.12	x	0.4	x	0.8	=	17.98	(74)
North	0.9x	0.77	x	1.71	x	13.12	x	0.4	x	0.8	=	4.97	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	x	6.18	x	8.86	x	0.4	x	0.8	=	12.15	(74)
North	0.9x	0.77	x	1.71	x	8.86	x	0.4	x	0.8	=	3.36	(74)
South	0.9x	0.77	x	4.1	x	46.75	x	0.4	x	0.8	=	42.51	(78)
South	0.9x	0.77	x	1.71	x	46.75	x	0.4	x	0.8	=	17.73	(78)
South	0.9x	0.77	x	4.1	x	76.57	x	0.4	x	0.8	=	69.62	(78)
South	0.9x	0.77	x	1.71	x	76.57	x	0.4	x	0.8	=	29.04	(78)
South	0.9x	0.77	x	4.1	x	97.53	x	0.4	x	0.8	=	88.68	(78)
South	0.9x	0.77	x	1.71	x	97.53	x	0.4	x	0.8	=	36.99	(78)
South	0.9x	0.77	x	4.1	x	110.23	x	0.4	x	0.8	=	100.23	(78)
South	0.9x	0.77	x	1.71	x	110.23	x	0.4	x	0.8	=	41.8	(78)
South	0.9x	0.77	x	4.1	x	114.87	x	0.4	x	0.8	=	104.44	(78)
South	0.9x	0.77	x	1.71	x	114.87	x	0.4	x	0.8	=	43.56	(78)

South	0.9x	0.77	x	4.1	x	110.55	x	0.4	x	0.8	=	100.51	(78)
South	0.9x	0.77	x	1.71	x	110.55	x	0.4	x	0.8	=	41.92	(78)
South	0.9x	0.77	x	4.1	x	108.01	x	0.4	x	0.8	=	98.21	(78)
South	0.9x	0.77	x	1.71	x	108.01	x	0.4	x	0.8	=	40.96	(78)
South	0.9x	0.77	x	4.1	x	104.89	x	0.4	x	0.8	=	95.37	(78)
South	0.9x	0.77	x	1.71	x	104.89	x	0.4	x	0.8	=	39.78	(78)
South	0.9x	0.77	x	4.1	x	101.89	x	0.4	x	0.8	=	92.64	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.4	x	0.8	=	38.64	(78)
South	0.9x	0.77	x	4.1	x	82.59	x	0.4	x	0.8	=	75.09	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.4	x	0.8	=	31.32	(78)
South	0.9x	0.77	x	4.1	x	55.42	x	0.4	x	0.8	=	50.39	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.4	x	0.8	=	21.01	(78)
South	0.9x	0.77	x	4.1	x	40.4	x	0.4	x	0.8	=	36.73	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.4	x	0.8	=	15.32	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	84.12	144.3	203.23	266.63	315.85	322.11	306.92	268.24	224.54	160.75	100.87	71.96	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	503.02	561.17	606.93	649.07	676.71	662.14	633.38	600.56	567.74	525.42	490.22	479.82	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.81	0.62	0.43	0.31	0.34	0.55	0.85	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.62	20.73	20.86	20.97	21	21	21	21	21	20.96	20.78	20.6	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.43	20.43	20.43	20.44	20.44	20.45	20.45	20.45	20.45	20.44	20.44	20.43	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.92	0.79	0.59	0.4	0.27	0.3	0.5	0.82	0.97	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.92	20.08	20.26	20.4	20.44	20.45	20.45	20.45	20.45	20.4	20.17	19.9	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.22	20.35	20.51	20.64	20.67	20.68	20.68	20.68	20.68	20.64	20.43	20.19	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.22	20.35	20.51	20.64	20.67	20.68	20.68	20.68	20.68	20.64	20.43	20.19	(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

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.99	0.97	0.93	0.8	0.6	0.41	0.29	0.32	0.52	0.83	0.97	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	497.45	545.68	561.89	516.63	407.4	272.99	183.22	191.64	296.81	434.45	474.65	475.95	(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=	744.05	720.17	651.04	537.16	409.27	273.04	183.23	191.65	297.24	457.77	611.64	738.44	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	183.47	117.26	66.33	14.78	1.4	0	0	0	0	17.35	98.63	195.29

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 694.5 (98)

Space heating requirement in kWh/m²/year 8.95 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		694.5	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	763.95	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		2091.65	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2300.82	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	30.65	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		163.07	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	163.07	(331)
Energy for lighting (calculated in Appendix L)		337.48	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-802.3	(333)

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Electricity generated by wind turbine (Appendix M) (negative quantity)			0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	= 498.63	(367)
Electrical energy for heat distribution	[(313) x		0.52	= 15.91	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			= 514.53	(373)
CO2 associated with space heating (secondary)	(309) x		0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			514.53	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	= 84.63	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	= 175.15	(379)
Energy saving/generation technologies (333) to (334) as applicable					
Item 1		0.52	x 0.01 =	-416.4	(380)
Total CO2, kg/year	sum of (376)…(382) =			357.92	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			4.61	(384)
EI rating (section 14)				96.09	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 109

Address : AC 109, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	77.6	(1a) x	2.6	(2a) =	201.76	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	77.6	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	201.76	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.15	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.43	0.42	0.42	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 2			4.1	x1/[1/(1.4)+ 0.04] =	5.44			(27)
Windows Type 3			6.18	x1/[1/(1.4)+ 0.04] =	8.19			(27)
Windows Type 4			1.71	x1/[1/(1.4)+ 0.04] =	2.27			(27)
Windows Type 5			1.71	x1/[1/(1.4)+ 0.04] =	2.27			(27)
Walls	46.59	15.94	30.65	x 0.18 =	5.52			(29)
Total area of elements, m²			46.59					(31)
Party wall			44.62	x 0 =	0			(32)

** 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) = 26.65 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 4.88 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.53 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.51	39.26	39.03	37.92	37.71	36.74	36.74	36.56	37.11	37.71	38.13	38.57	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	71.04	70.8	70.56	69.45	69.24	68.27	68.27	68.09	68.65	69.24	69.66	70.1	

Average = Sum(39)$_{1…12}$ /12= 69.45 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.92	0.91	0.91	0.89	0.89	0.88	0.88	0.88	0.88	0.89	0.9	0.9

Average = Sum(40)1…12 /12= 0.89 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.42 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.57 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	100.73	97.07	93.41	89.74	86.08	82.42	82.42	86.08	89.74	93.41	97.07	100.73

Total = Sum(44)1…12 = 1098.89 (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=	149.38	130.65	134.82	117.54	112.78	97.32	90.18	103.49	104.72	122.04	133.22	144.67

Total = Sum(45)1…12 = 1440.81 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.41	19.6	20.22	17.63	16.92	14.6	13.53	15.52	15.71	18.31	19.98	21.7	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	195.98	172.74	181.41	162.63	159.38	142.41	136.78	150.08	149.81	168.64	178.31	191.26	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	195.98	172.74	181.41	162.63	159.38	142.41	136.78	150.08	149.81	168.64	178.31	191.26	

Output from water heater (annual)1...12 1989.43 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	86.95	77.11	82.1	75.16	74.78	68.43	67.26	71.69	70.89	77.86	80.37	85.38	(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=	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	120.79	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	19.2	17.05	13.87	10.5	7.85	6.62	7.16	9.3	12.49	15.86	18.51	19.73	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	214.35	216.58	210.97	199.04	183.98	169.82	160.36	158.14	163.74	175.67	190.74	204.89	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	35.08	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	-96.63	(71)

Water heating gains (Table 5)

(72)m=	116.86	114.75	110.35	104.38	100.5	95.05	90.41	96.35	98.46	104.64	111.62	114.76	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	412.64	410.61	397.43	376.15	354.56	333.72	320.16	326.03	336.93	358.41	383.1	401.61	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.24	x	10.63	x	0.63	x	0.7	=	7.28	(74)
North	0.9x	0.77	x	6.18	x	10.63	x	0.63	x	0.7	=	20.08	(74)
North	0.9x	0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.63	x	0.7	=	13.91	(74)
North	0.9x	0.77	x	6.18	x	20.32	x	0.63	x	0.7	=	38.38	(74)

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North	0.9x	0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.63	x	0.7	=	23.64	(74)
North	0.9x	0.77	x	6.18	x	34.53	x	0.63	x	0.7	=	65.22	(74)
North	0.9x	0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.63	x	0.7	=	37.97	(74)
North	0.9x	0.77	x	6.18	x	55.46	x	0.63	x	0.7	=	104.76	(74)
North	0.9x	0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.63	x	0.7	=	51.15	(74)
North	0.9x	0.77	x	6.18	x	74.72	x	0.63	x	0.7	=	141.11	(74)
North	0.9x	0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.63	x	0.7	=	54.76	(74)
North	0.9x	0.77	x	6.18	x	79.99	x	0.63	x	0.7	=	151.07	(74)
North	0.9x	0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.63	x	0.7	=	51.12	(74)
North	0.9x	0.77	x	6.18	x	74.68	x	0.63	x	0.7	=	141.04	(74)
North	0.9x	0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.63	x	0.7	=	40.56	(74)
North	0.9x	0.77	x	6.18	x	59.25	x	0.63	x	0.7	=	111.9	(74)
North	0.9x	0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.63	x	0.7	=	28.42	(74)
North	0.9x	0.77	x	6.18	x	41.52	x	0.63	x	0.7	=	78.41	(74)
North	0.9x	0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.63	x	0.7	=	16.56	(74)
North	0.9x	0.77	x	6.18	x	24.19	x	0.63	x	0.7	=	45.69	(74)
North	0.9x	0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.63	x	0.7	=	8.98	(74)
North	0.9x	0.77	x	6.18	x	13.12	x	0.63	x	0.7	=	24.78	(74)
North	0.9x	0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.63	x	0.7	=	6.07	(74)
North	0.9x	0.77	x	6.18	x	8.86	x	0.63	x	0.7	=	16.74	(74)
North	0.9x	0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
South	0.9x	0.77	x	4.1	x	46.75	x	0.63	x	0.7	=	58.58	(78)
South	0.9x	0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x	0.77	x	4.1	x	76.57	x	0.63	x	0.7	=	95.94	(78)
South	0.9x	0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x	0.77	x	4.1	x	97.53	x	0.63	x	0.7	=	122.21	(78)
South	0.9x	0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x	0.77	x	4.1	x	110.23	x	0.63	x	0.7	=	138.13	(78)
South	0.9x	0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x	0.77	x	4.1	x	114.87	x	0.63	x	0.7	=	143.94	(78)
South	0.9x	0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)

South	0.9x	0.77	x	4.1	x	110.55	x	0.63	x	0.7	=	138.52	(78)
South	0.9x	0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x	0.77	x	4.1	x	108.01	x	0.63	x	0.7	=	135.34	(78)
South	0.9x	0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x	0.77	x	4.1	x	104.89	x	0.63	x	0.7	=	131.43	(78)
South	0.9x	0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)
South	0.9x	0.77	x	4.1	x	101.89	x	0.63	x	0.7	=	127.66	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x	0.77	x	4.1	x	82.59	x	0.63	x	0.7	=	103.48	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x	0.77	x	4.1	x	55.42	x	0.63	x	0.7	=	69.44	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	4.1	x	40.4	x	0.63	x	0.7	=	50.62	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	115.93	198.87	280.08	367.44	435.28	443.91	422.98	369.67	309.44	221.53	139.01	99.17	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	528.58	609.47	677.51	743.6	789.84	777.64	743.14	695.7	646.37	579.94	522.11	500.79	(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	0.97	0.91	0.76	0.56	0.4	0.45	0.7	0.94	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.17	20.32	20.54	20.79	20.94	20.99	21	21	20.97	20.77	20.43	20.14	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.15	20.16	20.16	20.17	20.17	20.18	20.18	20.19	20.18	20.17	20.17	20.16	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.96	0.88	0.71	0.49	0.33	0.37	0.63	0.91	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.04	19.27	19.58	19.94	20.12	20.18	20.18	20.19	20.16	19.92	19.43	19.01	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.51	19.71	19.98	20.29	20.47	20.52	20.53	20.53	20.5	20.28	19.85	19.49	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.51	19.71	19.98	20.29	20.47	20.52	20.53	20.53	20.5	20.28	19.85	19.49	(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

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.99	0.98	0.96	0.89	0.73	0.52	0.36	0.4	0.66	0.91	0.98	0.99	(94)

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Useful gains, hmGm , W = (94)m x (84)m

(95)m=	525.01	599.81	650.4	658.7	574.61	400.98	267.73	280.41	425.94	530.6	513.76	498.25	(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=	1080.68	1048.48	951.27	791.24	607.06	404.24	268.02	280.98	439.47	670.27	888.18	1071.51	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	413.42	301.51	223.85	95.43	24.14	0	0	0	0	103.91	269.59	426.51

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1858.35 (98)

Space heating requirement in kWh/m²/year 23.95 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	413.42	301.51	223.85	95.43	24.14	0	0	0	0	103.91	269.59	426.51	
(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	442.16	322.47	239.41	102.06	25.82	0	0	0	0	111.14	288.33	456.16	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1987.54 (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)

195.98	172.74	181.41	162.63	159.38	142.41	136.78	150.08	149.81	168.64	178.31	191.26

Efficiency of water heater 79.8 (216)

(217)m=	86.76	86.29	85.38	83.45	81.06	79.8	79.8	79.8	79.8	83.57	85.91	86.89	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	225.89	200.19	212.49	194.89	196.61	178.46	171.4	188.07	187.74	201.8	207.55	220.11

Total = Sum(219a)$_{1...12}$ = 2385.2 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1987.54	
Water heating fuel used		2385.2	
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		338.99	(232)

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	=	429.31	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	515.2	(264)
Space and water heating	(261) + (262) + (263) + (264) =			944.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	175.94	(268)
Total CO2, kg/year		sum of (265)…(271) =		1159.37	(272)

TER = 21.63 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:37:09

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.1m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 208

Address : AC 208, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	23.86 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	6.04 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	32.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	30.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.5	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	6.18m²	
Windows facing: South	1.66m²	
Windows facing: North	4.1m²	
Windows facing: North	1.64m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 208

Address : AC 208, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1	(1a) x	2.6	(2a) =	135.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	135.46	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(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

0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			6.18	x1/[1/(1.4)+ 0.04]	=	8.19			(27)
Windows Type 2			1.66	x1/[1/(1.4)+ 0.04]	=	2.2			(27)
Windows Type 3			4.1	x1/[1/(1.4)+ 0.04]	=	5.44			(27)
Windows Type 4			1.64	x1/[1/(1.4)+ 0.04]	=	2.17			(27)
Walls	31.1	13.58	17.52	x 0.12	=	2.1			(29)
Total area of elements, m²			31.1						(31)
Party wall			44.62	x 0	=	0			(32)

** 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) = 20.11 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.41 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.52 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	10.1	10	9.91	9.43	9.34	8.86	8.86	8.77	9.05	9.34	9.53	9.72	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	35.61	35.52	35.42	34.95	34.85	34.38	34.38	34.28	34.57	34.85	35.04	35.23	

Average = Sum(39)$_{1…12}$ /12= 34.92 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.68	0.68	0.68	0.67	0.67	0.66	0.66	0.66	0.66	0.67	0.67	0.68

Average = Sum(40)$_{1...12}$ /12= 0.67 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.75 (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 75.81 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39	
									Total = Sum(44)$_{1...12}$ =			909.73	(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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77	
									Total = Sum(45)$_{1...12}$ =			1192.79	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96	(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) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	178.94	158.09	166.89	150.8	148.64	134.06	129.94	140.95	140.19	156.31	163.78	175.04	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	178.94	158.09	166.89	150.8	148.64	134.06	129.94	140.95	140.19	156.31	163.78	175.04	

Output from water heater (annual)$_{1...12}$ 1843.63 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	85.34	75.91	81.33	75.15	75.27	69.58	69.05	72.71	71.62	77.82	79.47	84.04	(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=	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.61	12.09	9.83	7.44	5.56	4.7	5.08	6.6	8.86	11.24	13.12	13.99	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	152.69	154.27	150.28	141.78	131.05	120.96	114.23	112.64	116.63	125.13	135.86	145.95	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)

Water heating gains (Table 5)

(72)m=	114.71	112.95	109.32	104.37	101.16	96.64	92.8	97.72	99.47	104.59	110.37	112.96	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	330.28	328.59	318.71	302.87	287.06	271.59	261.39	266.25	274.24	290.25	308.64	322.18	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	4.1	x	10.63	x	0.4	x	0.8	=	9.67	(74)
North	0.9x	0.77	x	1.64	x	10.63	x	0.4	x	0.8	=	3.87	(74)
North	0.9x	0.77	x	4.1	x	20.32	x	0.4	x	0.8	=	18.48	(74)
North	0.9x	0.77	x	1.64	x	20.32	x	0.4	x	0.8	=	7.39	(74)
North	0.9x	0.77	x	4.1	x	34.53	x	0.4	x	0.8	=	31.4	(74)

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North	0.9x	0.77	x	1.64	x	34.53	x	0.4	x	0.8	=	12.56	(74)
North	0.9x	0.77	x	4.1	x	55.46	x	0.4	x	0.8	=	50.43	(74)
North	0.9x	0.77	x	1.64	x	55.46	x	0.4	x	0.8	=	20.17	(74)
North	0.9x	0.77	x	4.1	x	74.72	x	0.4	x	0.8	=	67.93	(74)
North	0.9x	0.77	x	1.64	x	74.72	x	0.4	x	0.8	=	27.17	(74)
North	0.9x	0.77	x	4.1	x	79.99	x	0.4	x	0.8	=	72.72	(74)
North	0.9x	0.77	x	1.64	x	79.99	x	0.4	x	0.8	=	29.09	(74)
North	0.9x	0.77	x	4.1	x	74.68	x	0.4	x	0.8	=	67.9	(74)
North	0.9x	0.77	x	1.64	x	74.68	x	0.4	x	0.8	=	27.16	(74)
North	0.9x	0.77	x	4.1	x	59.25	x	0.4	x	0.8	=	53.87	(74)
North	0.9x	0.77	x	1.64	x	59.25	x	0.4	x	0.8	=	21.55	(74)
North	0.9x	0.77	x	4.1	x	41.52	x	0.4	x	0.8	=	37.75	(74)
North	0.9x	0.77	x	1.64	x	41.52	x	0.4	x	0.8	=	15.1	(74)
North	0.9x	0.77	x	4.1	x	24.19	x	0.4	x	0.8	=	21.99	(74)
North	0.9x	0.77	x	1.64	x	24.19	x	0.4	x	0.8	=	8.8	(74)
North	0.9x	0.77	x	4.1	x	13.12	x	0.4	x	0.8	=	11.93	(74)
North	0.9x	0.77	x	1.64	x	13.12	x	0.4	x	0.8	=	4.77	(74)
North	0.9x	0.77	x	4.1	x	8.86	x	0.4	x	0.8	=	8.06	(74)
North	0.9x	0.77	x	1.64	x	8.86	x	0.4	x	0.8	=	3.22	(74)
South	0.9x	0.77	x	6.18	x	46.75	x	0.4	x	0.8	=	64.07	(78)
South	0.9x	0.77	x	1.66	x	46.75	x	0.4	x	0.8	=	17.21	(78)
South	0.9x	0.77	x	6.18	x	76.57	x	0.4	x	0.8	=	104.93	(78)
South	0.9x	0.77	x	1.66	x	76.57	x	0.4	x	0.8	=	28.19	(78)
South	0.9x	0.77	x	6.18	x	97.53	x	0.4	x	0.8	=	133.67	(78)
South	0.9x	0.77	x	1.66	x	97.53	x	0.4	x	0.8	=	35.9	(78)
South	0.9x	0.77	x	6.18	x	110.23	x	0.4	x	0.8	=	151.07	(78)
South	0.9x	0.77	x	1.66	x	110.23	x	0.4	x	0.8	=	40.58	(78)
South	0.9x	0.77	x	6.18	x	114.87	x	0.4	x	0.8	=	157.43	(78)
South	0.9x	0.77	x	1.66	x	114.87	x	0.4	x	0.8	=	42.29	(78)
South	0.9x	0.77	x	6.18	x	110.55	x	0.4	x	0.8	=	151.5	(78)
South	0.9x	0.77	x	1.66	x	110.55	x	0.4	x	0.8	=	40.7	(78)
South	0.9x	0.77	x	6.18	x	108.01	x	0.4	x	0.8	=	148.03	(78)
South	0.9x	0.77	x	1.66	x	108.01	x	0.4	x	0.8	=	39.76	(78)
South	0.9x	0.77	x	6.18	x	104.89	x	0.4	x	0.8	=	143.76	(78)
South	0.9x	0.77	x	1.66	x	104.89	x	0.4	x	0.8	=	38.61	(78)
South	0.9x	0.77	x	6.18	x	101.89	x	0.4	x	0.8	=	139.63	(78)
South	0.9x	0.77	x	1.66	x	101.89	x	0.4	x	0.8	=	37.51	(78)
South	0.9x	0.77	x	6.18	x	82.59	x	0.4	x	0.8	=	113.18	(78)
South	0.9x	0.77	x	1.66	x	82.59	x	0.4	x	0.8	=	30.4	(78)
South	0.9x	0.77	x	6.18	x	55.42	x	0.4	x	0.8	=	75.95	(78)
South	0.9x	0.77	x	1.66	x	55.42	x	0.4	x	0.8	=	20.4	(78)

South	0.9x	0.77	x	6.18	x	40.4	x	0.4	x	0.8	=	55.36	(78)
South	0.9x	0.77	x	1.66	x	40.4	x	0.4	x	0.8	=	14.87	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	94.82	158.99	213.53	262.25	294.82	294.01	282.85	257.78	229.98	174.37	113.05	81.52	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	425.1	487.58	532.23	565.13	581.88	565.6	544.23	524.03	504.23	464.62	421.68	403.7	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.94	0.87	0.73	0.55	0.39	0.28	0.3	0.47	0.75	0.94	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.65	20.78	20.9	20.98	21	21	21	21	21	20.98	20.82	20.62	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.36	20.36	20.36	20.37	20.37	20.38	20.38	20.38	20.37	20.37	20.37	20.36	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.93	0.85	0.69	0.52	0.35	0.24	0.26	0.43	0.71	0.93	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.9	20.08	20.24	20.34	20.37	20.38	20.38	20.38	20.37	20.34	20.15	19.86	(90)

fLA = Living area ÷ (4) = 0.49 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.26	20.42	20.56	20.65	20.67	20.68	20.68	20.68	20.68	20.65	20.48	20.23	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.26	20.42	20.56	20.65	20.67	20.68	20.68	20.68	20.68	20.65	20.48	20.23	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.93	0.86	0.71	0.54	0.37	0.26	0.28	0.45	0.73	0.93	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	412.96	454.81	455.1	401.14	311.7	208.98	140.27	146.77	227.18	340.32	391.52	394.98	(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=	568.5	551.33	498.18	410.72	312.76	209.03	140.28	146.77	227.4	350.34	468.77	564.71	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	115.72	64.86	32.05	6.89	0.79	0	0	0	0	7.45	55.62	126.27	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 409.67 (98)

Space heating requirement in kWh/m²/year 7.86 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

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Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		409.67	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	450.63	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		1843.63	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2028	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	24.79	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		103.29	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	103.29	(331)
Energy for lighting (calculated in Appendix L)		240.39	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-538.9	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	403.26	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	12.86	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	416.13	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)

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Total CO2 associated with space and water heating	(373) + (374) + (375) =			416.13	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	53.61	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	124.76	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-279.69	(380)
Total CO2, kg/year	sum of (376)…(382) =			314.81	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			6.04	(384)
EI rating (section 14)				95.66	(385)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 208

Address : AC 208, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1	(1a) x	2.6	(2a) =	135.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		135.46	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.15	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			5.93	x1/[1/(1.4)+ 0.04] =	7.86			(27)
Windows Type 2			1.59	x1/[1/(1.4)+ 0.04] =	2.11			(27)
Windows Type 3			3.93	x1/[1/(1.4)+ 0.04] =	5.21			(27)
Windows Type 4			1.57	x1/[1/(1.4)+ 0.04] =	2.08			(27)
Walls	31.1	13.02	18.08	x 0.18 =	3.25			(29)
Total area of elements, m²			31.1					(31)
Party wall			44.62	x 0 =	0			(32)

** 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) = 20.52 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.74 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 24.25 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.5	26.34	26.18	25.44	25.3	24.66	24.66	24.54	24.9	25.3	25.58	25.88	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	50.76	50.59	50.44	49.69	49.56	48.91	48.91	48.79	49.16	49.56	49.84	50.13	

Average = Sum(39)$_{1…12}$ /12= 49.69 (39)

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Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	0.97	0.97	0.97	0.95	0.95	0.94	0.94	0.94	0.94	0.95	0.96	0.96

Average = Sum(40)1…12 /12= 0.95 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.75 (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 — 75.81 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39

Total = Sum(44)1…12 = 909.73 (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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77

Total = Sum(45)1…12 = 1192.79 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (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) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	170.26	150.25	158.21	142.4	139.96	125.66	121.25	132.27	131.79	147.63	155.38	166.36	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	170.26	150.25	158.21	142.4	139.96	125.66	121.25	132.27	131.79	147.63	155.38	166.36	

Output from water heater (annual)$_{1...12}$ 1741.41 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	78.4	69.63	74.39	68.43	68.32	62.86	62.1	65.76	64.9	70.87	72.74	77.1	(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=	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	87.6	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.61	12.09	9.83	7.44	5.56	4.7	5.08	6.6	8.86	11.24	13.12	13.99	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	152.69	154.27	150.28	141.78	131.05	120.96	114.23	112.64	116.63	125.13	135.86	145.95	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	(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=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)

Water heating gains (Table 5)

(72)m=	105.37	103.62	99.98	95.04	91.83	87.31	83.47	88.39	90.14	95.26	101.03	103.63	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	323.95	322.26	312.37	296.54	280.72	265.25	255.05	259.91	267.91	283.91	302.3	315.85	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	3.93	x	10.63	x	0.63	x	0.7	=	12.77	(74)
North	0.9x	0.77	x	1.57	x	10.63	x	0.63	x	0.7	=	5.1	(74)
North	0.9x	0.77	x	3.93	x	20.32	x	0.63	x	0.7	=	24.41	(74)
North	0.9x	0.77	x	1.57	x	20.32	x	0.63	x	0.7	=	9.75	(74)
North	0.9x	0.77	x	3.93	x	34.53	x	0.63	x	0.7	=	41.47	(74)

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North	0.9x	0.77	x	1.57	x	34.53	x	0.63	x	0.7	=	16.57	(74)
North	0.9x	0.77	x	3.93	x	55.46	x	0.63	x	0.7	=	66.62	(74)
North	0.9x	0.77	x	1.57	x	55.46	x	0.63	x	0.7	=	26.61	(74)
North	0.9x	0.77	x	3.93	x	74.72	x	0.63	x	0.7	=	89.74	(74)
North	0.9x	0.77	x	1.57	x	74.72	x	0.63	x	0.7	=	35.85	(74)
North	0.9x	0.77	x	3.93	x	79.99	x	0.63	x	0.7	=	96.07	(74)
North	0.9x	0.77	x	1.57	x	79.99	x	0.63	x	0.7	=	38.38	(74)
North	0.9x	0.77	x	3.93	x	74.68	x	0.63	x	0.7	=	89.69	(74)
North	0.9x	0.77	x	1.57	x	74.68	x	0.63	x	0.7	=	35.83	(74)
North	0.9x	0.77	x	3.93	x	59.25	x	0.63	x	0.7	=	71.16	(74)
North	0.9x	0.77	x	1.57	x	59.25	x	0.63	x	0.7	=	28.43	(74)
North	0.9x	0.77	x	3.93	x	41.52	x	0.63	x	0.7	=	49.86	(74)
North	0.9x	0.77	x	1.57	x	41.52	x	0.63	x	0.7	=	19.92	(74)
North	0.9x	0.77	x	3.93	x	24.19	x	0.63	x	0.7	=	29.05	(74)
North	0.9x	0.77	x	1.57	x	24.19	x	0.63	x	0.7	=	11.61	(74)
North	0.9x	0.77	x	3.93	x	13.12	x	0.63	x	0.7	=	15.76	(74)
North	0.9x	0.77	x	1.57	x	13.12	x	0.63	x	0.7	=	6.29	(74)
North	0.9x	0.77	x	3.93	x	8.86	x	0.63	x	0.7	=	10.65	(74)
North	0.9x	0.77	x	1.57	x	8.86	x	0.63	x	0.7	=	4.25	(74)
South	0.9x	0.77	x	5.93	x	46.75	x	0.63	x	0.7	=	84.73	(78)
South	0.9x	0.77	x	1.59	x	46.75	x	0.63	x	0.7	=	22.72	(78)
South	0.9x	0.77	x	5.93	x	76.57	x	0.63	x	0.7	=	138.76	(78)
South	0.9x	0.77	x	1.59	x	76.57	x	0.63	x	0.7	=	37.21	(78)
South	0.9x	0.77	x	5.93	x	97.53	x	0.63	x	0.7	=	176.76	(78)
South	0.9x	0.77	x	1.59	x	97.53	x	0.63	x	0.7	=	47.39	(78)
South	0.9x	0.77	x	5.93	x	110.23	x	0.63	x	0.7	=	199.78	(78)
South	0.9x	0.77	x	1.59	x	110.23	x	0.63	x	0.7	=	53.57	(78)
South	0.9x	0.77	x	5.93	x	114.87	x	0.63	x	0.7	=	208.18	(78)
South	0.9x	0.77	x	1.59	x	114.87	x	0.63	x	0.7	=	55.82	(78)
South	0.9x	0.77	x	5.93	x	110.55	x	0.63	x	0.7	=	200.34	(78)
South	0.9x	0.77	x	1.59	x	110.55	x	0.63	x	0.7	=	53.72	(78)
South	0.9x	0.77	x	5.93	x	108.01	x	0.63	x	0.7	=	195.75	(78)
South	0.9x	0.77	x	1.59	x	108.01	x	0.63	x	0.7	=	52.49	(78)
South	0.9x	0.77	x	5.93	x	104.89	x	0.63	x	0.7	=	190.1	(78)
South	0.9x	0.77	x	1.59	x	104.89	x	0.63	x	0.7	=	50.97	(78)
South	0.9x	0.77	x	5.93	x	101.89	x	0.63	x	0.7	=	184.65	(78)
South	0.9x	0.77	x	1.59	x	101.89	x	0.63	x	0.7	=	49.51	(78)
South	0.9x	0.77	x	5.93	x	82.59	x	0.63	x	0.7	=	149.67	(78)
South	0.9x	0.77	x	1.59	x	82.59	x	0.63	x	0.7	=	40.13	(78)
South	0.9x	0.77	x	5.93	x	55.42	x	0.63	x	0.7	=	100.43	(78)
South	0.9x	0.77	x	1.59	x	55.42	x	0.63	x	0.7	=	26.93	(78)

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South	0.9x	0.77	x	5.93	x	40.4	x	0.63	x	0.7	=	73.21	(78)
South	0.9x	0.77	x	1.59	x	40.4	x	0.63	x	0.7	=	19.63	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	125.32	210.13	282.19	346.57	389.59	388.51	373.76	340.66	303.94	230.46	149.41	107.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	449.27	532.38	594.57	643.11	670.31	653.76	628.81	600.57	571.85	514.37	451.71	423.59	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.97	0.93	0.82	0.66	0.48	0.34	0.37	0.58	0.86	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.25	20.44	20.66	20.87	20.97	21	21	21	20.99	20.86	20.52	20.21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.1	20.11	20.11	20.12	20.12	20.13	20.13	20.14	20.13	20.12	20.12	20.11	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.96	0.91	0.79	0.61	0.41	0.27	0.3	0.51	0.82	0.96	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.12	19.4	19.71	19.98	20.1	20.13	20.13	20.14	20.12	19.98	19.53	19.08	(90)

fLA = Living area ÷ (4) = 0.49 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.67	19.91	20.17	20.41	20.52	20.55	20.56	20.56	20.54	20.41	20.02	19.63	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.67	19.91	20.17	20.41	20.52	20.55	20.56	20.56	20.54	20.41	20.02	19.63	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.96	0.91	0.8	0.63	0.44	0.31	0.34	0.55	0.83	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	441.1	509.82	539.75	514.36	424.06	289.84	193.37	202.61	312.4	426.48	433.02	417.7	(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=	780.17	759.4	689.6	572.11	437.13	291.18	193.5	202.82	316.79	486.06	643.63	773.53	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	252.27	167.71	111.48	41.58	9.73	0	0	0	0	44.33	151.64	264.74	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1043.47 (98)

Space heating requirement in kWh/m²/year 20.03 (99)

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) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	252.27	167.71	111.48	41.58	9.73	0	0	0	0	44.33	151.64	264.74		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	269.8	179.37	119.23	44.47	10.4	0	0	0	0	47.41	162.19	283.14		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1116.01	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)	170.26	150.25	158.21	142.4	139.96	125.66	121.25	132.27	131.79	147.63	155.38	166.36		
Efficiency of water heater													79.8	(216)
(217)m=	85.86	85.11	83.9	81.99	80.42	79.8	79.8	79.8	79.8	82.04	84.75	86.05		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	198.3	176.54	188.56	173.68	174.04	157.47	151.95	165.75	165.15	179.95	183.34	193.33		
Total = Sum(219a)$_{1...12}$ =													2108.06	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1116.01	
Water heating fuel used			2108.06	
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			240.39	(232)

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	=	241.06	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	455.34	(264)
Space and water heating	(261) + (262) + (263) + (264) =				696.4	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	124.76	(268)

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Total CO2, kg/year	sum of (265)…(271) =	860.09	(272)
TER =		23.86	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:37:19

Project Information:

Assessed By:	John Simpson (STRO006273)	**Building Type:**	Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 77.4m²	
Site Reference :	Maitland Park Estate	**Plot Reference:**	AC 209
Address :	AC 209, Aspen Court, Maitland Park Estate, London, NW3 2EH		

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	21.12 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	4.66 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	30.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	2.24m²	
Windows facing: South	6.18m²	
Windows facing: South	1.71m²	
Windows facing: North	4.1m²	
Windows facing: North	2.24m²	
Windows facing: North	1.68m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 209

Address : AC 209, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	77.4	(1a) x	2.6	(2a) =	201.24	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	77.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	201.24	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.08	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 2			6.18	x1/[1/(1.4)+ 0.04] =	8.19			(27)
Windows Type 3			1.71	x1/[1/(1.4)+ 0.04] =	2.27			(27)
Windows Type 4			4.1	x1/[1/(1.4)+ 0.04] =	5.44			(27)
Windows Type 5			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 6			1.68	x1/[1/(1.4)+ 0.04] =	2.23			(27)
Walls	46.54	18.15	28.39	x 0.12 =	3.41			(29)
Total area of elements, m²			46.54					(31)
Party wall			44.62	x 0 =	0			(32)

** 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) = 27.47 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 7.52 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.99 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	15	14.86	14.72	14.01	13.87	13.17	13.17	13.02	13.45	13.87	14.15	14.44	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	49.99	49.85	49.71	49	48.86	48.15	48.15	48.01	48.43	48.86	49.14	49.42	

Average = Sum(39)$_{1…12}$ /12= 48.96 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.65	0.64	0.64	0.63	0.63	0.62	0.62	0.62	0.63	0.63	0.63	0.64

Average = Sum(40)1…12 /12= 0.63 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.41 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.48 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	100.63	96.97	93.31	89.65	85.99	82.33	82.33	85.99	89.65	93.31	96.97	100.63

Total = Sum(44)1…12 = 1097.73 (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=	149.22	130.51	134.68	117.41	112.66	97.22	90.09	103.38	104.61	121.91	133.08	144.52

Total = Sum(45)1…12 = 1439.29 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.38	19.58	20.2	17.61	16.9	14.58	13.51	15.51	15.69	18.29	19.96	21.68

(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) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26

(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	204.5	180.44	189.95	170.91	167.94	150.71	145.36	158.65	158.11	177.19	186.57	199.79	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	204.5	180.44	189.95	170.91	167.94	150.71	145.36	158.65	158.11	177.19	186.57	199.79	

Output from water heater (annual)$_{1...12}$ 2090.13 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	93.84	83.34	89	81.84	81.68	75.12	74.18	78.59	77.58	84.76	87.04	92.27	(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=	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	19.07	16.94	13.78	10.43	7.8	6.58	7.11	9.24	12.41	15.75	18.39	19.6	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	213.92	216.14	210.55	198.64	183.61	169.48	160.04	157.82	163.41	175.32	190.35	204.48	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	(71)

Water heating gains (Table 5)

(72)m=	126.13	124.01	119.63	113.66	109.79	104.33	99.7	105.64	107.75	113.92	120.89	124.02	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	418.29	416.27	403.12	381.9	360.36	339.57	326.02	331.87	342.74	364.17	388.81	407.28	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	4.1	x	10.63	x	0.4	x	0.8	=	9.67	(74)
North	0.9x	0.77	x	2.24	x	10.63	x	0.4	x	0.8	=	5.28	(74)
North	0.9x	0.77	x	1.68	x	10.63	x	0.4	x	0.8	=	3.96	(74)
North	0.9x	0.77	x	4.1	x	20.32	x	0.4	x	0.8	=	18.48	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.4	x	0.8	=	10.09	(74)

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North	0.9x	0.77	x	1.68	x	20.32	x	0.4	x	0.8	=	7.57	(74)
North	0.9x	0.77	x	4.1	x	34.53	x	0.4	x	0.8	=	31.4	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.4	x	0.8	=	17.15	(74)
North	0.9x	0.77	x	1.68	x	34.53	x	0.4	x	0.8	=	12.86	(74)
North	0.9x	0.77	x	4.1	x	55.46	x	0.4	x	0.8	=	50.43	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(74)
North	0.9x	0.77	x	1.68	x	55.46	x	0.4	x	0.8	=	20.66	(74)
North	0.9x	0.77	x	4.1	x	74.72	x	0.4	x	0.8	=	67.93	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	x	1.68	x	74.72	x	0.4	x	0.8	=	27.84	(74)
North	0.9x	0.77	x	4.1	x	79.99	x	0.4	x	0.8	=	72.72	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	1.68	x	79.99	x	0.4	x	0.8	=	29.8	(74)
North	0.9x	0.77	x	4.1	x	74.68	x	0.4	x	0.8	=	67.9	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	1.68	x	74.68	x	0.4	x	0.8	=	27.82	(74)
North	0.9x	0.77	x	4.1	x	59.25	x	0.4	x	0.8	=	53.87	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	1.68	x	59.25	x	0.4	x	0.8	=	22.07	(74)
North	0.9x	0.77	x	4.1	x	41.52	x	0.4	x	0.8	=	37.75	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	x	1.68	x	41.52	x	0.4	x	0.8	=	15.47	(74)
North	0.9x	0.77	x	4.1	x	24.19	x	0.4	x	0.8	=	21.99	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	x	1.68	x	24.19	x	0.4	x	0.8	=	9.01	(74)
North	0.9x	0.77	x	4.1	x	13.12	x	0.4	x	0.8	=	11.93	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	x	1.68	x	13.12	x	0.4	x	0.8	=	4.89	(74)
North	0.9x	0.77	x	4.1	x	8.86	x	0.4	x	0.8	=	8.06	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	x	1.68	x	8.86	x	0.4	x	0.8	=	3.3	(74)
South	0.9x	0.77	x	2.24	x	46.75	x	0.4	x	0.8	=	23.22	(78)
South	0.9x	0.77	x	6.18	x	46.75	x	0.4	x	0.8	=	64.07	(78)
South	0.9x	0.77	x	1.71	x	46.75	x	0.4	x	0.8	=	17.73	(78)
South	0.9x	0.77	x	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	x	6.18	x	76.57	x	0.4	x	0.8	=	104.93	(78)
South	0.9x	0.77	x	1.71	x	76.57	x	0.4	x	0.8	=	29.04	(78)
South	0.9x	0.77	x	2.24	x	97.53	x	0.4	x	0.8	=	48.45	(78)
South	0.9x	0.77	x	6.18	x	97.53	x	0.4	x	0.8	=	133.67	(78)
South	0.9x	0.77	x	1.71	x	97.53	x	0.4	x	0.8	=	36.99	(78)
South	0.9x	0.77	x	2.24	x	110.23	x	0.4	x	0.8	=	54.76	(78)

South	0.9x	0.77	x	6.18	x	110.23	x	0.4	x	0.8	=	151.07	(78)
South	0.9x	0.77	x	1.71	x	110.23	x	0.4	x	0.8	=	41.8	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.4	x	0.8	=	57.06	(78)
South	0.9x	0.77	x	6.18	x	114.87	x	0.4	x	0.8	=	157.43	(78)
South	0.9x	0.77	x	1.71	x	114.87	x	0.4	x	0.8	=	43.56	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	x	6.18	x	110.55	x	0.4	x	0.8	=	151.5	(78)
South	0.9x	0.77	x	1.71	x	110.55	x	0.4	x	0.8	=	41.92	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	x	6.18	x	108.01	x	0.4	x	0.8	=	148.03	(78)
South	0.9x	0.77	x	1.71	x	108.01	x	0.4	x	0.8	=	40.96	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.4	x	0.8	=	52.11	(78)
South	0.9x	0.77	x	6.18	x	104.89	x	0.4	x	0.8	=	143.76	(78)
South	0.9x	0.77	x	1.71	x	104.89	x	0.4	x	0.8	=	39.78	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.4	x	0.8	=	50.61	(78)
South	0.9x	0.77	x	6.18	x	101.89	x	0.4	x	0.8	=	139.63	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.4	x	0.8	=	38.64	(78)
South	0.9x	0.77	x	2.24	x	82.59	x	0.4	x	0.8	=	41.02	(78)
South	0.9x	0.77	x	6.18	x	82.59	x	0.4	x	0.8	=	113.18	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.4	x	0.8	=	31.32	(78)
South	0.9x	0.77	x	2.24	x	55.42	x	0.4	x	0.8	=	27.53	(78)
South	0.9x	0.77	x	6.18	x	55.42	x	0.4	x	0.8	=	75.95	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.4	x	0.8	=	21.01	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)
South	0.9x	0.77	x	6.18	x	40.4	x	0.4	x	0.8	=	55.36	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.4	x	0.8	=	15.32	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	123.94	208.15	280.52	346.28	390.93	390.59	375.45	341.01	302.72	228.54	147.82	106.52	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.23	624.41	683.64	728.18	751.3	730.16	701.48	672.88	645.46	592.72	536.63	513.8	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.97	0.91	0.78	0.6	0.42	0.3	0.33	0.52	0.81	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.6	20.74	20.87	20.97	21	21	21	21	21	20.96	20.78	20.57	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.39	20.39	20.39	20.4	20.4	20.41	20.41	20.41	20.41	20.4	20.4	20.4	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.96	0.9	0.75	0.56	0.38	0.26	0.29	0.47	0.78	0.96	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.86	20.05	20.24	20.37	20.4	20.41	20.41	20.41	20.41	20.37	20.13	19.82	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.17	20.34	20.5	20.62	20.65	20.66	20.66	20.66	20.66	20.62	20.4	20.14	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.17	20.34	20.5	20.62	20.65	20.66	20.66	20.66	20.66	20.62	20.4	20.14	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.96	0.9	0.76	0.58	0.4	0.28	0.3	0.49	0.79	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	534.33	599.5	614.79	555.34	435.25	291.62	195.39	204.46	317.08	468.67	514.34	508.43	(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=	793.42	769.62	696.1	574.27	437.27	291.69	195.39	204.47	317.5	489.45	653.61	787.7	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	192.77	114.32	60.5	13.63	1.5	0	0	0	0	15.46	100.27	207.77	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 706.22 (98)

Space heating requirement in kWh/m²/year 9.12 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		706.22	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	776.84	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		2090.13	
If DHW from community scheme:			

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Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2299.15	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	30.76	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		162.65	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	162.65	(331)
Energy for lighting (calculated in Appendix L)		336.8	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-799.71	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	500.45	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	15.96	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	516.42	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				516.42	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	84.42	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	174.8	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1			0.52	x 0.01 =	-415.05	(380)
Total CO2, kg/year	sum of (376)…(382) =				360.58	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				4.66	(384)
EI rating (section 14)					96.05	(385)

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User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 209

Address : AC 209, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	77.4	(1a) x	2.6	(2a) =	201.24	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	77.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	201.24	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30 ÷ (5) =	0.15	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)			
Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.43	0.42	0.42	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 2			6.18	x1/[1/(1.4)+ 0.04] =	8.19			(27)
Windows Type 3			1.71	x1/[1/(1.4)+ 0.04] =	2.27			(27)
Windows Type 4			4.1	x1/[1/(1.4)+ 0.04] =	5.44			(27)
Windows Type 5			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 6			1.68	x1/[1/(1.4)+ 0.04] =	2.23			(27)
Walls	46.54	18.15	28.39	x 0.18 =	5.11			(29)
Total area of elements, m²			46.54					(31)
Party wall			44.62	x 0 =	0			(32)

** 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) = 29.17 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.18 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.35 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.42	39.17	38.94	37.83	37.62	36.65	36.65	36.47	37.03	37.62	38.04	38.48	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	73.77	73.53	73.29	72.18	71.97	71	71	70.82	71.38	71.97	72.39	72.83	

Average = Sum(39)$_{1…12}$ /12= 72.18 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.95	0.95	0.95	0.93	0.93	0.92	0.92	0.92	0.92	0.93	0.94	0.94

Average = Sum(40)1…12 /12= 0.93 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.41 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.48 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	100.63	96.97	93.31	89.65	85.99	82.33	82.33	85.99	89.65	93.31	96.97	100.63

Total = Sum(44)1…12 = 1097.73 (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=	149.22	130.51	134.68	117.41	112.66	97.22	90.09	103.38	104.61	121.91	133.08	144.52

Total = Sum(45)1…12 = 1439.29 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.38	19.58	20.2	17.61	16.9	14.58	13.51	15.51	15.69	18.29	19.96	21.68	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	195.82	172.6	181.27	162.51	159.26	142.31	136.68	149.97	149.7	168.51	178.17	191.11	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	195.82	172.6	181.27	162.51	159.26	142.31	136.68	149.97	149.7	168.51	178.17	191.11	

Output from water heater (annual)$_{1...12}$ 1987.91 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	86.89	77.06	82.06	75.11	74.74	68.4	67.23	71.65	70.86	77.81	80.32	85.33	(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=	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	120.58	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	19.07	16.94	13.78	10.43	7.8	6.58	7.11	9.24	12.41	15.75	18.39	19.6	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	213.92	216.14	210.55	198.64	183.61	169.48	160.04	157.82	163.41	175.32	190.35	204.48	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	35.06	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	-96.47	(71)

Water heating gains (Table 5)

(72)m=	116.79	114.68	110.29	104.32	100.45	95	90.36	96.3	98.41	104.59	111.56	114.69	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	411.96	409.93	396.79	375.57	354.03	333.23	319.69	325.54	336.41	357.84	382.47	400.95	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	4.1	x	10.63	x	0.63	x	0.7	=	13.32	(74)
North	0.9x	0.77	x	2.24	x	10.63	x	0.63	x	0.7	=	7.28	(74)
North	0.9x	0.77	x	1.68	x	10.63	x	0.63	x	0.7	=	5.46	(74)
North	0.9x	0.77	x	4.1	x	20.32	x	0.63	x	0.7	=	25.46	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.63	x	0.7	=	13.91	(74)

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North	0.9x	0.77	x	1.68	x	20.32	x	0.63	x	0.7	=	10.43	(74)
North	0.9x	0.77	x	4.1	x	34.53	x	0.63	x	0.7	=	43.27	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.63	x	0.7	=	23.64	(74)
North	0.9x	0.77	x	1.68	x	34.53	x	0.63	x	0.7	=	17.73	(74)
North	0.9x	0.77	x	4.1	x	55.46	x	0.63	x	0.7	=	69.5	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.63	x	0.7	=	37.97	(74)
North	0.9x	0.77	x	1.68	x	55.46	x	0.63	x	0.7	=	28.48	(74)
North	0.9x	0.77	x	4.1	x	74.72	x	0.63	x	0.7	=	93.62	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.63	x	0.7	=	51.15	(74)
North	0.9x	0.77	x	1.68	x	74.72	x	0.63	x	0.7	=	38.36	(74)
North	0.9x	0.77	x	4.1	x	79.99	x	0.63	x	0.7	=	100.22	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.63	x	0.7	=	54.76	(74)
North	0.9x	0.77	x	1.68	x	79.99	x	0.63	x	0.7	=	41.07	(74)
North	0.9x	0.77	x	4.1	x	74.68	x	0.63	x	0.7	=	93.57	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.63	x	0.7	=	51.12	(74)
North	0.9x	0.77	x	1.68	x	74.68	x	0.63	x	0.7	=	38.34	(74)
North	0.9x	0.77	x	4.1	x	59.25	x	0.63	x	0.7	=	74.24	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.63	x	0.7	=	40.56	(74)
North	0.9x	0.77	x	1.68	x	59.25	x	0.63	x	0.7	=	30.42	(74)
North	0.9x	0.77	x	4.1	x	41.52	x	0.63	x	0.7	=	52.02	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.63	x	0.7	=	28.42	(74)
North	0.9x	0.77	x	1.68	x	41.52	x	0.63	x	0.7	=	21.32	(74)
North	0.9x	0.77	x	4.1	x	24.19	x	0.63	x	0.7	=	30.31	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.63	x	0.7	=	16.56	(74)
North	0.9x	0.77	x	1.68	x	24.19	x	0.63	x	0.7	=	12.42	(74)
North	0.9x	0.77	x	4.1	x	13.12	x	0.63	x	0.7	=	16.44	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.63	x	0.7	=	8.98	(74)
North	0.9x	0.77	x	1.68	x	13.12	x	0.63	x	0.7	=	6.73	(74)
North	0.9x	0.77	x	4.1	x	8.86	x	0.63	x	0.7	=	11.11	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.63	x	0.7	=	6.07	(74)
North	0.9x	0.77	x	1.68	x	8.86	x	0.63	x	0.7	=	4.55	(74)
South	0.9x	0.77	x	2.24	x	46.75	x	0.63	x	0.7	=	32.01	(78)
South	0.9x	0.77	x	6.18	x	46.75	x	0.63	x	0.7	=	88.3	(78)
South	0.9x	0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x	0.77	x	2.24	x	76.57	x	0.63	x	0.7	=	52.42	(78)
South	0.9x	0.77	x	6.18	x	76.57	x	0.63	x	0.7	=	144.61	(78)
South	0.9x	0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x	0.77	x	2.24	x	97.53	x	0.63	x	0.7	=	66.77	(78)
South	0.9x	0.77	x	6.18	x	97.53	x	0.63	x	0.7	=	184.21	(78)
South	0.9x	0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x	0.77	x	2.24	x	110.23	x	0.63	x	0.7	=	75.46	(78)

South	0.9x	0.77	x	6.18	x	110.23	x	0.63	x	0.7	=	208.2	(78)
South	0.9x	0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.63	x	0.7	=	78.64	(78)
South	0.9x	0.77	x	6.18	x	114.87	x	0.63	x	0.7	=	216.96	(78)
South	0.9x	0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.63	x	0.7	=	75.68	(78)
South	0.9x	0.77	x	6.18	x	110.55	x	0.63	x	0.7	=	208.79	(78)
South	0.9x	0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.63	x	0.7	=	73.94	(78)
South	0.9x	0.77	x	6.18	x	108.01	x	0.63	x	0.7	=	204	(78)
South	0.9x	0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.63	x	0.7	=	71.81	(78)
South	0.9x	0.77	x	6.18	x	104.89	x	0.63	x	0.7	=	198.11	(78)
South	0.9x	0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.63	x	0.7	=	69.75	(78)
South	0.9x	0.77	x	6.18	x	101.89	x	0.63	x	0.7	=	192.43	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x	0.77	x	2.24	x	82.59	x	0.63	x	0.7	=	56.54	(78)
South	0.9x	0.77	x	6.18	x	82.59	x	0.63	x	0.7	=	155.98	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x	0.77	x	2.24	x	55.42	x	0.63	x	0.7	=	37.94	(78)
South	0.9x	0.77	x	6.18	x	55.42	x	0.63	x	0.7	=	104.67	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.63	x	0.7	=	27.66	(78)
South	0.9x	0.77	x	6.18	x	40.4	x	0.63	x	0.7	=	76.3	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	170.8	286.85	386.59	477.21	538.75	538.29	517.42	469.95	417.18	314.96	203.72	146.79	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	582.76	696.78	783.37	852.78	892.78	871.52	837.11	795.49	753.59	672.8	586.19	547.74	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.95	0.87	0.71	0.52	0.37	0.41	0.64	0.9	0.98	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.18	20.37	20.6	20.83	20.96	20.99	21	21	20.98	20.82	20.46	20.14	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.12	20.13	20.13	20.14	20.14	20.15	20.15	20.15	20.15	20.14	20.14	20.13	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.94	0.83	0.66	0.45	0.3	0.33	0.56	0.87	0.98	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.04	19.31	19.64	19.96	20.1	20.15	20.15	20.15	20.14	19.95	19.45	18.99	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.52	19.76	20.04	20.32	20.46	20.5	20.51	20.51	20.49	20.31	19.87	19.48	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.52	19.76	20.04	20.32	20.46	20.5	20.51	20.51	20.49	20.31	19.87	19.48	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.97	0.93	0.84	0.68	0.48	0.33	0.37	0.59	0.87	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	576.67	677.94	732.42	717.66	605.18	416.61	277.26	290.6	447.18	587.08	571.32	543.52	(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=	1122.41	1092.43	992.47	824.46	630.58	419.23	277.49	291.01	456.22	699.09	924.68	1112.66	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	406.03	278.54	193.48	76.89	18.9	0	0	0	0	83.34	254.43	423.44	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1735.04 (98)

Space heating requirement in kWh/m²/year 22.42 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	406.03	278.54	193.48	76.89	18.9	0	0	0	0	83.34	254.43	423.44	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	434.26	297.9	206.93	82.24	20.22	0	0	0	0	89.13	272.11	452.88	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1855.66 (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)

195.82	172.6	181.27	162.51	159.26	142.31	136.68	149.97	149.7	168.51	178.17	191.11

Efficiency of water heater 79.8 (216)

(217)m=	86.72	86.08	84.99	82.95	80.81	79.8	79.8	79.8	79.8	83.05	85.76	86.88	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	225.81	200.5	213.29	195.91	197.07	178.33	171.28	187.93	187.6	202.9	207.75	219.98

Total = Sum(219a)$_{1...12}$ = 2388.36 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1855.66	
Water heating fuel used		2388.36	
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		336.8	(232)

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	=	400.82	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	515.88	(264)
Space and water heating	(261) + (262) + (263) + (264) =				916.71	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	174.8	(268)
Total CO2, kg/year			sum of (265)…(271) =		1130.43	(272)

TER = 21.12 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:37:28

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 94.7m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 210

Address : AC 210, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	21.99 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	5.75 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North	2.24m²	
Windows facing: East	2.71m²	
Windows facing: East	6.73m²	
Windows facing: South	2.24m²	
Windows facing: South	1.5m²	
Windows facing: South	1.65m²	
Windows facing: South	1.68m²	
Windows facing: South	2.71m²	
Windows facing: East	2.71m²	
Windows facing: North	2.71m²	
Windows facing: North	4.1m²	
Windows facing: North	1.5m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features

Air permeablility	2.0 m³/m²h
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 210

Address : AC 210, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	94.7	(1a) x	2.6	(2a) =	246.22	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	94.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	246.22	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.09	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.12	0.12	0.11	0.1	0.1	0.09	0.09	0.09	0.09	0.1	0.1	0.11

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 2			2.71	x1/[1/(1.4)+ 0.04]		=	3.59			(27)
Windows Type 3			6.73	x1/[1/(1.4)+ 0.04]		=	8.92			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 5			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Windows Type 6			1.65	x1/[1/(1.4)+ 0.04]		=	2.19			(27)
Windows Type 7			1.68	x1/[1/(1.4)+ 0.04]		=	2.23			(27)
Windows Type 8			2.71	x1/[1/(1.4)+ 0.04]		=	3.59			(27)
Windows Type 9			2.71	x1/[1/(1.4)+ 0.04]		=	3.59			(27)
Windows Type 10			2.71	x1/[1/(1.4)+ 0.04]		=	3.59			(27)
Windows Type 11			4.1	x1/[1/(1.4)+ 0.04]		=	5.44			(27)
Windows Type 12			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Walls	79.14	32.48	46.66	x	0.12	=	5.6			(29)
Total area of elements, m²			79.14							(31)
Party wall			22.31	x	0	=	0			(32)

** 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) = 48.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 — 13.33 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss — (33) + (36) = 61.99 (37)

Ventilation heat loss calculated monthly — (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	19.13	18.94	18.75	17.81	17.63	16.69	16.69	16.5	17.06	17.63	18	18.38	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	81.12	80.93	80.75	79.81	79.62	78.68	78.68	78.49	79.05	79.62	79.99	80.37	

Average = Sum(39)1…12 /12= 79.76 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	0.86	0.85	0.85	0.84	0.84	0.83	0.83	0.83	0.83	0.84	0.84	0.85	

Average = Sum(40)1…12 /12= 0.84 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.68 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 97.96 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	107.76	103.84	99.92	96	92.09	88.17	88.17	92.09	96	99.92	103.84	107.76

Total = Sum(44)1…12 = 1175.55 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	159.8	139.77	144.23	125.74	120.65	104.11	96.47	110.71	112.03	130.56	142.51	154.76

Total = Sum(45)1…12 = 1541.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.97	20.96	21.63	18.86	18.1	15.62	14.47	16.61	16.8	19.58	21.38	23.21	(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) = 110 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a — 1.03 (52)

Temperature factor from Table 2b — 0.6 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.03	(54)
Enter (50) or (54) in (55)		1.03	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	215.08	189.69	199.5	179.23	175.93	157.61	151.75	165.98	165.52	185.83	196.01	210.04	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	215.08	189.69	199.5	179.23	175.93	157.61	151.75	165.98	165.52	185.83	196.01	210.04

Output from water heater (annual)1…12 | 2192.18 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	97.36	86.41	92.18	84.6	84.34	77.41	76.3	81.03	80.04	87.63	90.18	95.68	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	22.06	19.59	15.94	12.06	9.02	7.61	8.23	10.69	14.35	18.22	21.27	22.67	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	247.46	250.03	243.56	229.78	212.4	196.05	185.13	182.56	189.04	202.81	220.2	236.55	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	(71)

Water heating gains (Table 5)

(72)m=	130.86	128.59	123.89	117.5	113.36	107.52	102.55	108.91	111.17	117.78	125.25	128.6	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	463.65	461.49	446.66	422.62	398.04	374.45	359.18	365.44	377.83	402.09	429.99	451.09	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.24	x	10.63	x	0.4	x	0.8	=	5.28	(74)
North	0.9x	0.77	x	2.71	x	10.63	x	0.4	x	0.8	=	6.39	(74)
North	0.9x	0.77	x	4.1	x	10.63	x	0.4	x	0.8	=	9.67	(74)
North	0.9x	0.77	x	1.5	x	10.63	x	0.4	x	0.8	=	3.54	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.4	x	0.8	=	10.09	(74)
North	0.9x	0.77	x	2.71	x	20.32	x	0.4	x	0.8	=	12.21	(74)
North	0.9x	0.77	x	4.1	x	20.32	x	0.4	x	0.8	=	18.48	(74)
North	0.9x	0.77	x	1.5	x	20.32	x	0.4	x	0.8	=	6.76	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.4	x	0.8	=	17.15	(74)
North	0.9x	0.77	x	2.71	x	34.53	x	0.4	x	0.8	=	20.75	(74)
North	0.9x	0.77	x	4.1	x	34.53	x	0.4	x	0.8	=	31.4	(74)
North	0.9x	0.77	x	1.5	x	34.53	x	0.4	x	0.8	=	11.49	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(74)
North	0.9x	0.77	x	2.71	x	55.46	x	0.4	x	0.8	=	33.33	(74)
North	0.9x	0.77	x	4.1	x	55.46	x	0.4	x	0.8	=	50.43	(74)
North	0.9x	0.77	x	1.5	x	55.46	x	0.4	x	0.8	=	18.45	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	x	2.71	x	74.72	x	0.4	x	0.8	=	44.9	(74)
North	0.9x	0.77	x	4.1	x	74.72	x	0.4	x	0.8	=	67.93	(74)
North	0.9x	0.77	x	1.5	x	74.72	x	0.4	x	0.8	=	24.85	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	2.71	x	79.99	x	0.4	x	0.8	=	48.07	(74)
North	0.9x	0.77	x	4.1	x	79.99	x	0.4	x	0.8	=	72.72	(74)
North	0.9x	0.77	x	1.5	x	79.99	x	0.4	x	0.8	=	26.61	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	2.71	x	74.68	x	0.4	x	0.8	=	44.88	(74)
North	0.9x	0.77	x	4.1	x	74.68	x	0.4	x	0.8	=	67.9	(74)
North	0.9x	0.77	x	1.5	x	74.68	x	0.4	x	0.8	=	24.84	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	2.71	x	59.25	x	0.4	x	0.8	=	35.61	(74)
North	0.9x	0.77	x	4.1	x	59.25	x	0.4	x	0.8	=	53.87	(74)
North	0.9x	0.77	x	1.5	x	59.25	x	0.4	x	0.8	=	19.71	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	x	2.71	x	41.52	x	0.4	x	0.8	=	24.95	(74)
North	0.9x	0.77	x	4.1	x	41.52	x	0.4	x	0.8	=	37.75	(74)
North	0.9x	0.77	x	1.5	x	41.52	x	0.4	x	0.8	=	13.81	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	x	2.71	x	24.19	x	0.4	x	0.8	=	14.54	(74)
North	0.9x	0.77	x	4.1	x	24.19	x	0.4	x	0.8	=	21.99	(74)

DER WorkSheet: New dwelling design stage

North	0.9x	0.77	x	1.5	x	24.19	x	0.4	x	0.8	=	8.05	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	x	2.71	x	13.12	x	0.4	x	0.8	=	7.88	(74)
North	0.9x	0.77	x	4.1	x	13.12	x	0.4	x	0.8	=	11.93	(74)
North	0.9x	0.77	x	1.5	x	13.12	x	0.4	x	0.8	=	4.36	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	x	2.71	x	8.86	x	0.4	x	0.8	=	5.33	(74)
North	0.9x	0.77	x	4.1	x	8.86	x	0.4	x	0.8	=	8.06	(74)
North	0.9x	0.77	x	1.5	x	8.86	x	0.4	x	0.8	=	2.95	(74)
East	0.9x	0.77	x	2.71	x	19.64	x	0.4	x	0.8	=	11.8	(76)
East	0.9x	0.77	x	6.73	x	19.64	x	0.4	x	0.8	=	29.31	(76)
East	0.9x	0.77	x	2.71	x	19.64	x	0.4	x	0.8	=	11.8	(76)
East	0.9x	0.77	x	2.71	x	38.42	x	0.4	x	0.8	=	23.09	(76)
East	0.9x	0.77	x	6.73	x	38.42	x	0.4	x	0.8	=	57.34	(76)
East	0.9x	0.77	x	2.71	x	38.42	x	0.4	x	0.8	=	23.09	(76)
East	0.9x	0.77	x	2.71	x	63.27	x	0.4	x	0.8	=	38.03	(76)
East	0.9x	0.77	x	6.73	x	63.27	x	0.4	x	0.8	=	94.43	(76)
East	0.9x	0.77	x	2.71	x	63.27	x	0.4	x	0.8	=	38.03	(76)
East	0.9x	0.77	x	2.71	x	92.28	x	0.4	x	0.8	=	55.46	(76)
East	0.9x	0.77	x	6.73	x	92.28	x	0.4	x	0.8	=	137.72	(76)
East	0.9x	0.77	x	2.71	x	92.28	x	0.4	x	0.8	=	55.46	(76)
East	0.9x	0.77	x	2.71	x	113.09	x	0.4	x	0.8	=	67.97	(76)
East	0.9x	0.77	x	6.73	x	113.09	x	0.4	x	0.8	=	168.78	(76)
East	0.9x	0.77	x	2.71	x	113.09	x	0.4	x	0.8	=	67.97	(76)
East	0.9x	0.77	x	2.71	x	115.77	x	0.4	x	0.8	=	69.57	(76)
East	0.9x	0.77	x	6.73	x	115.77	x	0.4	x	0.8	=	172.78	(76)
East	0.9x	0.77	x	2.71	x	115.77	x	0.4	x	0.8	=	69.57	(76)
East	0.9x	0.77	x	2.71	x	110.22	x	0.4	x	0.8	=	66.24	(76)
East	0.9x	0.77	x	6.73	x	110.22	x	0.4	x	0.8	=	164.49	(76)
East	0.9x	0.77	x	2.71	x	110.22	x	0.4	x	0.8	=	66.24	(76)
East	0.9x	0.77	x	2.71	x	94.68	x	0.4	x	0.8	=	56.9	(76)
East	0.9x	0.77	x	6.73	x	94.68	x	0.4	x	0.8	=	141.3	(76)
East	0.9x	0.77	x	2.71	x	94.68	x	0.4	x	0.8	=	56.9	(76)
East	0.9x	0.77	x	2.71	x	73.59	x	0.4	x	0.8	=	44.22	(76)
East	0.9x	0.77	x	6.73	x	73.59	x	0.4	x	0.8	=	109.83	(76)
East	0.9x	0.77	x	2.71	x	73.59	x	0.4	x	0.8	=	44.22	(76)
East	0.9x	0.77	x	2.71	x	45.59	x	0.4	x	0.8	=	27.4	(76)
East	0.9x	0.77	x	6.73	x	45.59	x	0.4	x	0.8	=	68.04	(76)
East	0.9x	0.77	x	2.71	x	45.59	x	0.4	x	0.8	=	27.4	(76)
East	0.9x	0.77	x	2.71	x	24.49	x	0.4	x	0.8	=	14.72	(76)
East	0.9x	0.77	x	6.73	x	24.49	x	0.4	x	0.8	=	36.55	(76)

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East	0.9x	0.77	x	2.71	x	24.49	x	0.4	x	0.8	=	14.72	(76)
East	0.9x	0.77	x	2.71	x	16.15	x	0.4	x	0.8	=	9.71	(76)
East	0.9x	0.77	x	6.73	x	16.15	x	0.4	x	0.8	=	24.1	(76)
East	0.9x	0.77	x	2.71	x	16.15	x	0.4	x	0.8	=	9.71	(76)
South	0.9x	0.77	x	2.24	x	46.75	x	0.4	x	0.8	=	23.22	(78)
South	0.9x	0.77	x	1.5	x	46.75	x	0.4	x	0.8	=	15.55	(78)
South	0.9x	0.77	x	1.65	x	46.75	x	0.4	x	0.8	=	17.11	(78)
South	0.9x	0.77	x	1.68	x	46.75	x	0.4	x	0.8	=	17.42	(78)
South	0.9x	0.77	x	2.71	x	46.75	x	0.4	x	0.8	=	28.1	(78)
South	0.9x	0.77	x	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	x	1.5	x	76.57	x	0.4	x	0.8	=	25.47	(78)
South	0.9x	0.77	x	1.65	x	76.57	x	0.4	x	0.8	=	28.02	(78)
South	0.9x	0.77	x	1.68	x	76.57	x	0.4	x	0.8	=	28.53	(78)
South	0.9x	0.77	x	2.71	x	76.57	x	0.4	x	0.8	=	46.01	(78)
South	0.9x	0.77	x	2.24	x	97.53	x	0.4	x	0.8	=	48.45	(78)
South	0.9x	0.77	x	1.5	x	97.53	x	0.4	x	0.8	=	32.44	(78)
South	0.9x	0.77	x	1.65	x	97.53	x	0.4	x	0.8	=	35.69	(78)
South	0.9x	0.77	x	1.68	x	97.53	x	0.4	x	0.8	=	36.34	(78)
South	0.9x	0.77	x	2.71	x	97.53	x	0.4	x	0.8	=	58.61	(78)
South	0.9x	0.77	x	2.24	x	110.23	x	0.4	x	0.8	=	54.76	(78)
South	0.9x	0.77	x	1.5	x	110.23	x	0.4	x	0.8	=	36.67	(78)
South	0.9x	0.77	x	1.65	x	110.23	x	0.4	x	0.8	=	40.34	(78)
South	0.9x	0.77	x	1.68	x	110.23	x	0.4	x	0.8	=	41.07	(78)
South	0.9x	0.77	x	2.71	x	110.23	x	0.4	x	0.8	=	66.25	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.4	x	0.8	=	57.06	(78)
South	0.9x	0.77	x	1.5	x	114.87	x	0.4	x	0.8	=	38.21	(78)
South	0.9x	0.77	x	1.65	x	114.87	x	0.4	x	0.8	=	42.03	(78)
South	0.9x	0.77	x	1.68	x	114.87	x	0.4	x	0.8	=	42.8	(78)
South	0.9x	0.77	x	2.71	x	114.87	x	0.4	x	0.8	=	69.03	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	x	1.5	x	110.55	x	0.4	x	0.8	=	36.77	(78)
South	0.9x	0.77	x	1.65	x	110.55	x	0.4	x	0.8	=	40.45	(78)
South	0.9x	0.77	x	1.68	x	110.55	x	0.4	x	0.8	=	41.19	(78)
South	0.9x	0.77	x	2.71	x	110.55	x	0.4	x	0.8	=	66.44	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	x	1.5	x	108.01	x	0.4	x	0.8	=	35.93	(78)
South	0.9x	0.77	x	1.65	x	108.01	x	0.4	x	0.8	=	39.52	(78)
South	0.9x	0.77	x	1.68	x	108.01	x	0.4	x	0.8	=	40.24	(78)
South	0.9x	0.77	x	2.71	x	108.01	x	0.4	x	0.8	=	64.91	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.4	x	0.8	=	52.11	(78)
South	0.9x	0.77	x	1.5	x	104.89	x	0.4	x	0.8	=	34.89	(78)

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South	0.9x	0.77	x	1.65	x	104.89	x	0.4	x	0.8	=	38.38	(78)
South	0.9x	0.77	x	1.68	x	104.89	x	0.4	x	0.8	=	39.08	(78)
South	0.9x	0.77	x	2.71	x	104.89	x	0.4	x	0.8	=	63.04	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.4	x	0.8	=	50.61	(78)
South	0.9x	0.77	x	1.5	x	101.89	x	0.4	x	0.8	=	33.89	(78)
South	0.9x	0.77	x	1.65	x	101.89	x	0.4	x	0.8	=	37.28	(78)
South	0.9x	0.77	x	1.68	x	101.89	x	0.4	x	0.8	=	37.96	(78)
South	0.9x	0.77	x	2.71	x	101.89	x	0.4	x	0.8	=	61.23	(78)
South	0.9x	0.77	x	2.24	x	82.59	x	0.4	x	0.8	=	41.02	(78)
South	0.9x	0.77	x	1.5	x	82.59	x	0.4	x	0.8	=	27.47	(78)
South	0.9x	0.77	x	1.65	x	82.59	x	0.4	x	0.8	=	30.22	(78)
South	0.9x	0.77	x	1.68	x	82.59	x	0.4	x	0.8	=	30.77	(78)
South	0.9x	0.77	x	2.71	x	82.59	x	0.4	x	0.8	=	49.63	(78)
South	0.9x	0.77	x	2.24	x	55.42	x	0.4	x	0.8	=	27.53	(78)
South	0.9x	0.77	x	1.5	x	55.42	x	0.4	x	0.8	=	18.43	(78)
South	0.9x	0.77	x	1.65	x	55.42	x	0.4	x	0.8	=	20.28	(78)
South	0.9x	0.77	x	1.68	x	55.42	x	0.4	x	0.8	=	20.65	(78)
South	0.9x	0.77	x	2.71	x	55.42	x	0.4	x	0.8	=	33.3	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)
South	0.9x	0.77	x	1.5	x	40.4	x	0.4	x	0.8	=	13.44	(78)
South	0.9x	0.77	x	1.65	x	40.4	x	0.4	x	0.8	=	14.78	(78)
South	0.9x	0.77	x	1.68	x	40.4	x	0.4	x	0.8	=	15.05	(78)
South	0.9x	0.77	x	2.71	x	40.4	x	0.4	x	0.8	=	24.28	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	179.19	317.12	462.8	617.48	728.65	738.82	705.94	621.2	516.38	358.54	216.86	151.87	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	642.84	778.61	909.46	1040.1	1126.69	1113.27	1065.12	986.64	894.21	760.63	646.86	602.97	(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	0.98	0.95	0.83	0.64	0.45	0.32	0.37	0.6	0.9	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.25	20.44	20.68	20.89	20.98	21	21	21	20.99	20.85	20.5	20.21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.2	20.21	20.21	20.22	20.22	20.23	20.23	20.23	20.22	20.22	20.21	20.21	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.93	0.8	0.59	0.4	0.27	0.3	0.54	0.87	0.98	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.21	19.48	19.81	20.1	20.2	20.23	20.23	20.23	20.22	20.06	19.58	19.16	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.64	19.88	20.17	20.43	20.53	20.55	20.55	20.55	20.54	20.39	19.96	19.6	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.64	19.88	20.17	20.43	20.53	20.55	20.55	20.55	20.54	20.39	19.96	19.6	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.93	0.81	0.61	0.42	0.29	0.33	0.56	0.88	0.98	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	638.29	761.72	849.09	840.65	690.21	467.07	310.65	325.59	503.53	667.12	634.62	599.97	(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=	1244.54	1212.19	1104.05	920.5	702.84	467.99	310.72	325.74	509.1	779.31	1029.08	1237.51	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	451.05	302.72	189.69	57.49	9.4	0	0	0	0	83.47	284.01	474.33	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1852.16	(98)
Space heating requirement in kWh/m²/year	19.56	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1852.16	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2037.38	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		2192.18	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2411.39	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	44.49	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)

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Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		199.01	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	199.01	(331)
Energy for lighting (calculated in Appendix L)		389.61	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-979.34	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	723.8	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	23.09	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	746.89	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				746.89	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	103.28	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	202.21	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1			0.52	x 0.01 =	-508.28	(380)
Total CO2, kg/year	sum of (376)…(382) =				544.1	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				5.75	(384)
EI rating (section 14)					94.78	(385)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 210

Address : AC 210, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	94.7	(1a) x	2.6	(2a) =	246.22	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	94.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		246.22	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.12	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

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

0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			1.63	x1/[1/(1.4)+ 0.04]	=	2.16			(27)
Windows Type 2			1.98	x1/[1/(1.4)+ 0.04]	=	2.62			(27)
Windows Type 3			4.91	x1/[1/(1.4)+ 0.04]	=	6.51			(27)
Windows Type 4			1.63	x1/[1/(1.4)+ 0.04]	=	2.16			(27)
Windows Type 5			1.09	x1/[1/(1.4)+ 0.04]	=	1.45			(27)
Windows Type 6			1.2	x1/[1/(1.4)+ 0.04]	=	1.59			(27)
Windows Type 7			1.22	x1/[1/(1.4)+ 0.04]	=	1.62			(27)
Windows Type 8			1.98	x1/[1/(1.4)+ 0.04]	=	2.62			(27)
Windows Type 9			1.98	x1/[1/(1.4)+ 0.04]	=	2.62			(27)
Windows Type 10			1.98	x1/[1/(1.4)+ 0.04]	=	2.62			(27)
Windows Type 11			2.99	x1/[1/(1.4)+ 0.04]	=	3.96			(27)
Windows Type 12			1.09	x1/[1/(1.4)+ 0.04]	=	1.45			(27)
Walls	79.14	23.68	55.46	x 0.18	=	9.98			(29)
Total area of elements, m²			79.14						(31)
Party wall			22.31	x 0	=	0			(32)

** 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) = 41.38 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 — 8.94 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss — (33) + (36) = 50.31 (37)

Ventilation heat loss calculated monthly — (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	48.44	48.14	47.84	46.44	46.18	44.96	44.96	44.74	45.43	46.18	46.71	47.26	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	98.75	98.45	98.15	96.76	96.49	95.28	95.28	95.05	95.75	96.49	97.02	97.58

Average = Sum(39)1…12 /12= 96.75 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.04	1.04	1.04	1.02	1.02	1.01	1.01	1	1.01	1.02	1.02	1.03

Average = Sum(40)1…12 /12= 1.02 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.68 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 97.96 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m=	107.76	103.84	99.92	96	92.09	88.17	88.17	92.09	96	99.92	103.84	107.76

Total = Sum(44)1…12 = 1175.55 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	159.8	139.77	144.23	125.74	120.65	104.11	96.47	110.71	112.03	130.56	142.51	154.76

Total = Sum(45)1…12 = 1541.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.97	20.96	21.63	18.86	18.1	15.62	14.47	16.61	16.8	19.58	21.38	23.21	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (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 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	206.4	181.85	190.82	170.83	167.24	149.2	143.07	157.3	157.12	177.15	187.61	201.36	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	206.4	181.85	190.82	170.83	167.24	149.2	143.07	157.3	157.12	177.15	187.61	201.36

Output from water heater (annual)1…12 2089.95 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	90.41	80.14	85.23	77.88	77.39	70.69	69.35	74.09	73.32	80.69	83.46	88.73	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	22.06	19.59	15.94	12.06	9.02	7.61	8.23	10.69	14.35	18.22	21.27	22.67	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	247.46	250.03	243.56	229.78	212.4	196.05	185.13	182.56	189.04	202.81	220.2	236.55	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	(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=	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	(71)

Water heating gains (Table 5)

(72)m=	121.52	119.26	114.56	108.17	104.02	98.18	93.22	99.58	101.84	108.45	115.92	119.27	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	457.32	455.15	440.33	416.29	391.71	368.12	352.85	359.11	371.5	395.76	423.66	444.76	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.63	x	10.63	x	0.63	x	0.7	=	5.3	(74)
North	0.9x	0.77	x	1.98	x	10.63	x	0.63	x	0.7	=	6.43	(74)
North	0.9x	0.77	x	2.99	x	10.63	x	0.63	x	0.7	=	9.72	(74)
North	0.9x	0.77	x	1.09	x	10.63	x	0.63	x	0.7	=	3.54	(74)
North	0.9x	0.77	x	1.63	x	20.32	x	0.63	x	0.7	=	10.12	(74)
North	0.9x	0.77	x	1.98	x	20.32	x	0.63	x	0.7	=	12.3	(74)
North	0.9x	0.77	x	2.99	x	20.32	x	0.63	x	0.7	=	18.57	(74)
North	0.9x	0.77	x	1.09	x	20.32	x	0.63	x	0.7	=	6.77	(74)
North	0.9x	0.77	x	1.63	x	34.53	x	0.63	x	0.7	=	17.2	(74)
North	0.9x	0.77	x	1.98	x	34.53	x	0.63	x	0.7	=	20.89	(74)
North	0.9x	0.77	x	2.99	x	34.53	x	0.63	x	0.7	=	31.55	(74)
North	0.9x	0.77	x	1.09	x	34.53	x	0.63	x	0.7	=	11.5	(74)
North	0.9x	0.77	x	1.63	x	55.46	x	0.63	x	0.7	=	27.63	(74)
North	0.9x	0.77	x	1.98	x	55.46	x	0.63	x	0.7	=	33.56	(74)
North	0.9x	0.77	x	2.99	x	55.46	x	0.63	x	0.7	=	50.68	(74)
North	0.9x	0.77	x	1.09	x	55.46	x	0.63	x	0.7	=	18.48	(74)
North	0.9x	0.77	x	1.63	x	74.72	x	0.63	x	0.7	=	37.22	(74)
North	0.9x	0.77	x	1.98	x	74.72	x	0.63	x	0.7	=	45.21	(74)
North	0.9x	0.77	x	2.99	x	74.72	x	0.63	x	0.7	=	68.27	(74)
North	0.9x	0.77	x	1.09	x	74.72	x	0.63	x	0.7	=	24.89	(74)
North	0.9x	0.77	x	1.63	x	79.99	x	0.63	x	0.7	=	39.84	(74)
North	0.9x	0.77	x	1.98	x	79.99	x	0.63	x	0.7	=	48.4	(74)
North	0.9x	0.77	x	2.99	x	79.99	x	0.63	x	0.7	=	73.09	(74)
North	0.9x	0.77	x	1.09	x	79.99	x	0.63	x	0.7	=	26.64	(74)
North	0.9x	0.77	x	1.63	x	74.68	x	0.63	x	0.7	=	37.2	(74)
North	0.9x	0.77	x	1.98	x	74.68	x	0.63	x	0.7	=	45.19	(74)
North	0.9x	0.77	x	2.99	x	74.68	x	0.63	x	0.7	=	68.24	(74)
North	0.9x	0.77	x	1.09	x	74.68	x	0.63	x	0.7	=	24.88	(74)
North	0.9x	0.77	x	1.63	x	59.25	x	0.63	x	0.7	=	29.51	(74)
North	0.9x	0.77	x	1.98	x	59.25	x	0.63	x	0.7	=	35.85	(74)
North	0.9x	0.77	x	2.99	x	59.25	x	0.63	x	0.7	=	54.14	(74)
North	0.9x	0.77	x	1.09	x	59.25	x	0.63	x	0.7	=	19.74	(74)
North	0.9x	0.77	x	1.63	x	41.52	x	0.63	x	0.7	=	20.68	(74)
North	0.9x	0.77	x	1.98	x	41.52	x	0.63	x	0.7	=	25.12	(74)
North	0.9x	0.77	x	2.99	x	41.52	x	0.63	x	0.7	=	37.94	(74)
North	0.9x	0.77	x	1.09	x	41.52	x	0.63	x	0.7	=	13.83	(74)
North	0.9x	0.77	x	1.63	x	24.19	x	0.63	x	0.7	=	12.05	(74)
North	0.9x	0.77	x	1.98	x	24.19	x	0.63	x	0.7	=	14.64	(74)
North	0.9x	0.77	x	2.99	x	24.19	x	0.63	x	0.7	=	22.1	(74)

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North	0.9x	0.77	x	1.09	x	24.19	x	0.63	x	0.7	=	8.06	(74)
North	0.9x	0.77	x	1.63	x	13.12	x	0.63	x	0.7	=	6.53	(74)
North	0.9x	0.77	x	1.98	x	13.12	x	0.63	x	0.7	=	7.94	(74)
North	0.9x	0.77	x	2.99	x	13.12	x	0.63	x	0.7	=	11.99	(74)
North	0.9x	0.77	x	1.09	x	13.12	x	0.63	x	0.7	=	4.37	(74)
North	0.9x	0.77	x	1.63	x	8.86	x	0.63	x	0.7	=	4.42	(74)
North	0.9x	0.77	x	1.98	x	8.86	x	0.63	x	0.7	=	5.36	(74)
North	0.9x	0.77	x	2.99	x	8.86	x	0.63	x	0.7	=	8.1	(74)
North	0.9x	0.77	x	1.09	x	8.86	x	0.63	x	0.7	=	2.95	(74)
East	0.9x	0.77	x	1.98	x	19.64	x	0.63	x	0.7	=	11.88	(76)
East	0.9x	0.77	x	4.91	x	19.64	x	0.63	x	0.7	=	29.47	(76)
East	0.9x	0.77	x	1.98	x	19.64	x	0.63	x	0.7	=	11.88	(76)
East	0.9x	0.77	x	1.98	x	38.42	x	0.63	x	0.7	=	23.25	(76)
East	0.9x	0.77	x	4.91	x	38.42	x	0.63	x	0.7	=	57.65	(76)
East	0.9x	0.77	x	1.98	x	38.42	x	0.63	x	0.7	=	23.25	(76)
East	0.9x	0.77	x	1.98	x	63.27	x	0.63	x	0.7	=	38.29	(76)
East	0.9x	0.77	x	4.91	x	63.27	x	0.63	x	0.7	=	94.95	(76)
East	0.9x	0.77	x	1.98	x	63.27	x	0.63	x	0.7	=	38.29	(76)
East	0.9x	0.77	x	1.98	x	92.28	x	0.63	x	0.7	=	55.84	(76)
East	0.9x	0.77	x	4.91	x	92.28	x	0.63	x	0.7	=	138.47	(76)
East	0.9x	0.77	x	1.98	x	92.28	x	0.63	x	0.7	=	55.84	(76)
East	0.9x	0.77	x	1.98	x	113.09	x	0.63	x	0.7	=	68.43	(76)
East	0.9x	0.77	x	4.91	x	113.09	x	0.63	x	0.7	=	169.7	(76)
East	0.9x	0.77	x	1.98	x	113.09	x	0.63	x	0.7	=	68.43	(76)
East	0.9x	0.77	x	1.98	x	115.77	x	0.63	x	0.7	=	70.05	(76)
East	0.9x	0.77	x	4.91	x	115.77	x	0.63	x	0.7	=	173.72	(76)
East	0.9x	0.77	x	1.98	x	115.77	x	0.63	x	0.7	=	70.05	(76)
East	0.9x	0.77	x	1.98	x	110.22	x	0.63	x	0.7	=	66.69	(76)
East	0.9x	0.77	x	4.91	x	110.22	x	0.63	x	0.7	=	165.39	(76)
East	0.9x	0.77	x	1.98	x	110.22	x	0.63	x	0.7	=	66.69	(76)
East	0.9x	0.77	x	1.98	x	94.68	x	0.63	x	0.7	=	57.29	(76)
East	0.9x	0.77	x	4.91	x	94.68	x	0.63	x	0.7	=	142.07	(76)
East	0.9x	0.77	x	1.98	x	94.68	x	0.63	x	0.7	=	57.29	(76)
East	0.9x	0.77	x	1.98	x	73.59	x	0.63	x	0.7	=	44.53	(76)
East	0.9x	0.77	x	4.91	x	73.59	x	0.63	x	0.7	=	110.43	(76)
East	0.9x	0.77	x	1.98	x	73.59	x	0.63	x	0.7	=	44.53	(76)
East	0.9x	0.77	x	1.98	x	45.59	x	0.63	x	0.7	=	27.59	(76)
East	0.9x	0.77	x	4.91	x	45.59	x	0.63	x	0.7	=	68.41	(76)
East	0.9x	0.77	x	1.98	x	45.59	x	0.63	x	0.7	=	27.59	(76)
East	0.9x	0.77	x	1.98	x	24.49	x	0.63	x	0.7	=	14.82	(76)
East	0.9x	0.77	x	4.91	x	24.49	x	0.63	x	0.7	=	36.75	(76)

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East	0.9x	0.77	x	1.98	x	24.49	x	0.63	x	0.7	=	14.82	(76)
East	0.9x	0.77	x	1.98	x	16.15	x	0.63	x	0.7	=	9.77	(76)
East	0.9x	0.77	x	4.91	x	16.15	x	0.63	x	0.7	=	24.24	(76)
East	0.9x	0.77	x	1.98	x	16.15	x	0.63	x	0.7	=	9.77	(76)
South	0.9x	0.77	x	1.63	x	46.75	x	0.63	x	0.7	=	23.29	(78)
South	0.9x	0.77	x	1.09	x	46.75	x	0.63	x	0.7	=	15.57	(78)
South	0.9x	0.77	x	1.2	x	46.75	x	0.63	x	0.7	=	17.15	(78)
South	0.9x	0.77	x	1.22	x	46.75	x	0.63	x	0.7	=	17.43	(78)
South	0.9x	0.77	x	1.98	x	46.75	x	0.63	x	0.7	=	28.29	(78)
South	0.9x	0.77	x	1.63	x	76.57	x	0.63	x	0.7	=	38.14	(78)
South	0.9x	0.77	x	1.09	x	76.57	x	0.63	x	0.7	=	25.51	(78)
South	0.9x	0.77	x	1.2	x	76.57	x	0.63	x	0.7	=	28.08	(78)
South	0.9x	0.77	x	1.22	x	76.57	x	0.63	x	0.7	=	28.55	(78)
South	0.9x	0.77	x	1.98	x	76.57	x	0.63	x	0.7	=	46.33	(78)
South	0.9x	0.77	x	1.63	x	97.53	x	0.63	x	0.7	=	48.59	(78)
South	0.9x	0.77	x	1.09	x	97.53	x	0.63	x	0.7	=	32.49	(78)
South	0.9x	0.77	x	1.2	x	97.53	x	0.63	x	0.7	=	35.77	(78)
South	0.9x	0.77	x	1.22	x	97.53	x	0.63	x	0.7	=	36.37	(78)
South	0.9x	0.77	x	1.98	x	97.53	x	0.63	x	0.7	=	59.02	(78)
South	0.9x	0.77	x	1.63	x	110.23	x	0.63	x	0.7	=	54.91	(78)
South	0.9x	0.77	x	1.09	x	110.23	x	0.63	x	0.7	=	36.72	(78)
South	0.9x	0.77	x	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)
South	0.9x	0.77	x	1.22	x	110.23	x	0.63	x	0.7	=	41.1	(78)
South	0.9x	0.77	x	1.98	x	110.23	x	0.63	x	0.7	=	66.7	(78)
South	0.9x	0.77	x	1.63	x	114.87	x	0.63	x	0.7	=	57.22	(78)
South	0.9x	0.77	x	1.09	x	114.87	x	0.63	x	0.7	=	38.27	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	x	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.22	x	114.87	x	0.63	x	0.7	=	42.83	(78)
South	0.9x	0.77	x	1.98	x	114.87	x	0.63	x	0.7	=	69.51	(78)
South	0.9x	0.77	x	1.63	x	110.55	x	0.63	x	0.7	=	55.07	(78)
South	0.9x	0.77	x	1.09	x	110.55	x	0.63	x	0.7	=	36.83	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	x	1.22	x	110.55	x	0.63	x	0.7	=	41.22	(78)
South	0.9x	0.77	x	1.98	x	110.55	x	0.63	x	0.7	=	66.89	(78)
South	0.9x	0.77	x	1.63	x	108.01	x	0.63	x	0.7	=	53.81	(78)
South	0.9x	0.77	x	1.09	x	108.01	x	0.63	x	0.7	=	35.98	(78)
South	0.9x	0.77	x	1.2	x	108.01	x	0.63	x	0.7	=	39.61	(78)
South	0.9x	0.77	x	1.22	x	108.01	x	0.63	x	0.7	=	40.27	(78)
South	0.9x	0.77	x	1.98	x	108.01	x	0.63	x	0.7	=	65.36	(78)
South	0.9x	0.77	x	1.63	x	104.89	x	0.63	x	0.7	=	52.25	(78)
South	0.9x	0.77	x	1.09	x	104.89	x	0.63	x	0.7	=	34.94	(78)

South	0.9x	0.77	x	1.2	x	104.89	x	0.63	x	0.7	=	38.47	(78)
South	0.9x	0.77	x	1.22	x	104.89	x	0.63	x	0.7	=	39.11	(78)
South	0.9x	0.77	x	1.98	x	104.89	x	0.63	x	0.7	=	63.47	(78)
South	0.9x	0.77	x	1.63	x	101.89	x	0.63	x	0.7	=	50.75	(78)
South	0.9x	0.77	x	1.09	x	101.89	x	0.63	x	0.7	=	33.94	(78)
South	0.9x	0.77	x	1.2	x	101.89	x	0.63	x	0.7	=	37.37	(78)
South	0.9x	0.77	x	1.22	x	101.89	x	0.63	x	0.7	=	37.99	(78)
South	0.9x	0.77	x	1.98	x	101.89	x	0.63	x	0.7	=	61.65	(78)
South	0.9x	0.77	x	1.63	x	82.59	x	0.63	x	0.7	=	41.14	(78)
South	0.9x	0.77	x	1.09	x	82.59	x	0.63	x	0.7	=	27.51	(78)
South	0.9x	0.77	x	1.2	x	82.59	x	0.63	x	0.7	=	30.29	(78)
South	0.9x	0.77	x	1.22	x	82.59	x	0.63	x	0.7	=	30.79	(78)
South	0.9x	0.77	x	1.98	x	82.59	x	0.63	x	0.7	=	49.97	(78)
South	0.9x	0.77	x	1.63	x	55.42	x	0.63	x	0.7	=	27.61	(78)
South	0.9x	0.77	x	1.09	x	55.42	x	0.63	x	0.7	=	18.46	(78)
South	0.9x	0.77	x	1.2	x	55.42	x	0.63	x	0.7	=	20.32	(78)
South	0.9x	0.77	x	1.22	x	55.42	x	0.63	x	0.7	=	20.66	(78)
South	0.9x	0.77	x	1.98	x	55.42	x	0.63	x	0.7	=	33.53	(78)
South	0.9x	0.77	x	1.63	x	40.4	x	0.63	x	0.7	=	20.12	(78)
South	0.9x	0.77	x	1.09	x	40.4	x	0.63	x	0.7	=	13.46	(78)
South	0.9x	0.77	x	1.2	x	40.4	x	0.63	x	0.7	=	14.82	(78)
South	0.9x	0.77	x	1.22	x	40.4	x	0.63	x	0.7	=	15.06	(78)
South	0.9x	0.77	x	1.98	x	40.4	x	0.63	x	0.7	=	24.45	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	179.96	318.52	464.9	620.37	732.12	742.36	709.31	624.13	518.76	360.14	217.8	152.52	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	637.28	773.67	905.23	1036.66	1123.83	1110.47	1062.16	983.24	890.25	755.89	641.46	597.28	(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	0.97	0.89	0.74	0.54	0.39	0.44	0.7	0.94	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.97	20.17	20.45	20.75	20.93	20.99	21	21	20.96	20.7	20.28	19.94	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.05	20.05	20.05	20.07	20.07	20.08	20.08	20.08	20.07	20.07	20.06	20.06	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.96	0.86	0.68	0.47	0.31	0.36	0.62	0.92	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.68	18.97	19.37	19.79	20.01	20.07	20.08	20.08	20.05	19.74	19.14	18.64	(90)

fLA = Living area ÷ (4) = | 0.42 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.22	19.47	19.82	20.19	20.39	20.46	20.46	20.46	20.43	20.14	19.61	19.19	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.22	19.47	19.82	20.19	20.39	20.46	20.46	20.46	20.43	20.14	19.61	19.19	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.95	0.87	0.7	0.5	0.35	0.39	0.65	0.92	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	633.48	761.15	864.04	900.03	789.47	551.92	367.31	384.88	581.35	693.3	632.36	594.69	(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=	1473.6	1434.54	1307.01	1092.5	838.76	557.86	367.95	386.12	605.93	920.52	1213.89	1462.24	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	625.05	452.52	329.57	138.58	36.67	0	0	0	0	169.05	418.7	645.46	

Total per year (kWh/year) = Sum(98)1...5,9...12 = 2815.6 (98)

Space heating requirement in kWh/m²/year 29.73 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	625.05	452.52	329.57	138.58	36.67	0	0	0	0	169.05	418.7	645.46	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	668.5	483.98	352.49	148.21	39.22	0	0	0	0	180.8	447.81	690.33	

Total (kWh/year) =Sum(211)1...5,10....12= 3011.34 (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)

	206.4	181.85	190.82	170.83	167.24	149.2	143.07	157.3	157.12	177.15	187.61	201.36	
Efficiency of water heater													79.8 (216)
(217)m=	87.58	87.15	86.26	84.26	81.53	79.8	79.8	79.8	79.8	84.69	86.89	87.7	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	235.66	208.66	221.22	202.74	205.12	186.97	179.29	197.12	196.89	209.18	215.9	229.59

Total = Sum(219a)1...12 = 2488.33 (219)

TER WorkSheet: New dwelling design stage

Annual totals		kWh/year	kWh/year	
Space heating fuel used, main system 1			3011.34	
Water heating fuel used			2488.33	
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			389.61	(232)

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	=	650.45	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	537.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1187.93	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	202.21	(268)
Total CO2, kg/year		sum of (265)…(271) =		1429.06	(272)

TER = 21.99 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 02 September 2020 at 17:37:01

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74.4m²

Site Reference : Maitland Park Estate **Plot Reference:** AC 410

Address : AC 410, Aspen Court, Maitland Park Estate, London, NW3 2EH

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	26.49 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	7.52 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North	2.24m²	
Windows facing: East	2.71m²	
Windows facing: East	6.73m²	
Windows facing: South	2.24m²	
Windows facing: South	1.5m²	
Windows facing: South	2.71m²	
Windows facing: East	2.71m²	
Windows facing: North	2.71m²	
Windows facing: North	1.5m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	

10 Key features

Air permeablility	2.0 m³/m²h
Roofs U-value	0.1 W/m²K
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 410

Address : AC 410, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	74.4	(1a)	x	2.6	(2a)	=	193.44	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74.4	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			193.44	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.1	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.09	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.12	0.12	0.11	0.1	0.1	0.09	0.09	0.09	0.09	0.1	0.1	0.11

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24		x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 2			2.71		x1/[1/(1.4)+ 0.04]	=	3.59			(27)
Windows Type 3			6.73		x1/[1/(1.4)+ 0.04]	=	8.92			(27)
Windows Type 4			2.24		x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 5			1.5		x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 6			2.71		x1/[1/(1.4)+ 0.04]	=	3.59			(27)
Windows Type 7			2.71		x1/[1/(1.4)+ 0.04]	=	3.59			(27)
Windows Type 8			2.71		x1/[1/(1.4)+ 0.04]	=	3.59			(27)
Windows Type 9			1.5		x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Walls	66.82	25.05	41.77	x	0.12	=	5.01			(29)
Roof	74.4	0	74.4	x	0.1	=	7.44			(30)
Total area of elements, m²			141.22							(31)
Party wall			44.62	x	0	=	0			(32)

** 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) = 45.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 11.37 (36) *if details of thermal bridging are not known (36) = 0.05 x (31)*

Total fabric heat loss (33) + (36) = 57.03 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	15.03	14.88	14.73	14	13.85	13.11	13.11	12.96	13.41	13.85	14.14	14.44	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	72.06	71.91	71.76	71.03	70.88	70.14	70.14	69.99	70.43	70.88	71.17	71.47	

Average = Sum(39)$_{1…12}$ /12= 70.99 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.97	0.97	0.96	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.96	0.96

Average = Sum(40)$_{1…12}$ /12= 0.95 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.35 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.97 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96

Total = Sum(44)$_{1…12}$ = 1079.59 (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=	146.76	128.36	132.45	115.47	110.8	95.61	88.6	101.67	102.88	119.9	130.88	142.13

Total = Sum(45)$_{1…12}$ = 1415.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.01	19.25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(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) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	202.04	178.28	187.73	168.97	166.08	149.11	143.88	156.95	156.38	175.18	184.37	197.4	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	202.04	178.28	187.73	168.97	166.08	149.11	143.88	156.95	156.38	175.18	184.37	197.4

Output from water heater (annual)$_{1…12}$ 2066.36 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	93.02	82.62	88.26	81.19	81.06	74.59	73.68	78.03	77	84.09	86.31	91.48	(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=	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.96	158.39	169.93	184.5	198.19	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	(71)

Water heating gains (Table 5)

(72)m=	125.03	122.95	118.63	112.76	108.96	103.59	99.03	104.87	106.95	113.02	119.88	122.96	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	409.07	407.08	394.27	373.62	352.69	332.46	319.26	325.02	335.58	356.44	380.42	398.37	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.24	x	10.63	x	0.4	x	0.8	=	5.28	(74)
North	0.9x	0.77	x	2.71	x	10.63	x	0.4	x	0.8	=	6.39	(74)
North	0.9x	0.77	x	1.5	x	10.63	x	0.4	x	0.8	=	3.54	(74)
North	0.9x	0.77	x	2.24	x	20.32	x	0.4	x	0.8	=	10.09	(74)
North	0.9x	0.77	x	2.71	x	20.32	x	0.4	x	0.8	=	12.21	(74)
North	0.9x	0.77	x	1.5	x	20.32	x	0.4	x	0.8	=	6.76	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.4	x	0.8	=	17.15	(74)
North	0.9x	0.77	x	2.71	x	34.53	x	0.4	x	0.8	=	20.75	(74)
North	0.9x	0.77	x	1.5	x	34.53	x	0.4	x	0.8	=	11.49	(74)
North	0.9x	0.77	x	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(74)
North	0.9x	0.77	x	2.71	x	55.46	x	0.4	x	0.8	=	33.33	(74)
North	0.9x	0.77	x	1.5	x	55.46	x	0.4	x	0.8	=	18.45	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	x	2.71	x	74.72	x	0.4	x	0.8	=	44.9	(74)
North	0.9x	0.77	x	1.5	x	74.72	x	0.4	x	0.8	=	24.85	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	2.71	x	79.99	x	0.4	x	0.8	=	48.07	(74)
North	0.9x	0.77	x	1.5	x	79.99	x	0.4	x	0.8	=	26.61	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	2.71	x	74.68	x	0.4	x	0.8	=	44.88	(74)
North	0.9x	0.77	x	1.5	x	74.68	x	0.4	x	0.8	=	24.84	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	2.71	x	59.25	x	0.4	x	0.8	=	35.61	(74)
North	0.9x	0.77	x	1.5	x	59.25	x	0.4	x	0.8	=	19.71	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	x	2.71	x	41.52	x	0.4	x	0.8	=	24.95	(74)
North	0.9x	0.77	x	1.5	x	41.52	x	0.4	x	0.8	=	13.81	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	x	2.71	x	24.19	x	0.4	x	0.8	=	14.54	(74)
North	0.9x	0.77	x	1.5	x	24.19	x	0.4	x	0.8	=	8.05	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	x	2.71	x	13.12	x	0.4	x	0.8	=	7.88	(74)
North	0.9x	0.77	x	1.5	x	13.12	x	0.4	x	0.8	=	4.36	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	x	2.71	x	8.86	x	0.4	x	0.8	=	5.33	(74)
North	0.9x	0.77	x	1.5	x	8.86	x	0.4	x	0.8	=	2.95	(74)
East	0.9x	0.77	x	2.71	x	19.64	x	0.4	x	0.8	=	11.8	(76)
East	0.9x	0.77	x	6.73	x	19.64	x	0.4	x	0.8	=	29.31	(76)
East	0.9x	0.77	x	2.71	x	19.64	x	0.4	x	0.8	=	11.8	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	2.71	x	38.42	x	0.4	x	0.8	=	23.09	(76)
East	0.9x	0.77	x	6.73	x	38.42	x	0.4	x	0.8	=	57.34	(76)
East	0.9x	0.77	x	2.71	x	38.42	x	0.4	x	0.8	=	23.09	(76)
East	0.9x	0.77	x	2.71	x	63.27	x	0.4	x	0.8	=	38.03	(76)
East	0.9x	0.77	x	6.73	x	63.27	x	0.4	x	0.8	=	94.43	(76)
East	0.9x	0.77	x	2.71	x	63.27	x	0.4	x	0.8	=	38.03	(76)
East	0.9x	0.77	x	2.71	x	92.28	x	0.4	x	0.8	=	55.46	(76)
East	0.9x	0.77	x	6.73	x	92.28	x	0.4	x	0.8	=	137.72	(76)
East	0.9x	0.77	x	2.71	x	92.28	x	0.4	x	0.8	=	55.46	(76)
East	0.9x	0.77	x	2.71	x	113.09	x	0.4	x	0.8	=	67.97	(76)
East	0.9x	0.77	x	6.73	x	113.09	x	0.4	x	0.8	=	168.78	(76)
East	0.9x	0.77	x	2.71	x	113.09	x	0.4	x	0.8	=	67.97	(76)
East	0.9x	0.77	x	2.71	x	115.77	x	0.4	x	0.8	=	69.57	(76)
East	0.9x	0.77	x	6.73	x	115.77	x	0.4	x	0.8	=	172.78	(76)
East	0.9x	0.77	x	2.71	x	115.77	x	0.4	x	0.8	=	69.57	(76)
East	0.9x	0.77	x	2.71	x	110.22	x	0.4	x	0.8	=	66.24	(76)
East	0.9x	0.77	x	6.73	x	110.22	x	0.4	x	0.8	=	164.49	(76)
East	0.9x	0.77	x	2.71	x	110.22	x	0.4	x	0.8	=	66.24	(76)
East	0.9x	0.77	x	2.71	x	94.68	x	0.4	x	0.8	=	56.9	(76)
East	0.9x	0.77	x	6.73	x	94.68	x	0.4	x	0.8	=	141.3	(76)
East	0.9x	0.77	x	2.71	x	94.68	x	0.4	x	0.8	=	56.9	(76)
East	0.9x	0.77	x	2.71	x	73.59	x	0.4	x	0.8	=	44.22	(76)
East	0.9x	0.77	x	6.73	x	73.59	x	0.4	x	0.8	=	109.83	(76)
East	0.9x	0.77	x	2.71	x	73.59	x	0.4	x	0.8	=	44.22	(76)
East	0.9x	0.77	x	2.71	x	45.59	x	0.4	x	0.8	=	27.4	(76)
East	0.9x	0.77	x	6.73	x	45.59	x	0.4	x	0.8	=	68.04	(76)
East	0.9x	0.77	x	2.71	x	45.59	x	0.4	x	0.8	=	27.4	(76)
East	0.9x	0.77	x	2.71	x	24.49	x	0.4	x	0.8	=	14.72	(76)
East	0.9x	0.77	x	6.73	x	24.49	x	0.4	x	0.8	=	36.55	(76)
East	0.9x	0.77	x	2.71	x	24.49	x	0.4	x	0.8	=	14.72	(76)
East	0.9x	0.77	x	2.71	x	16.15	x	0.4	x	0.8	=	9.71	(76)
East	0.9x	0.77	x	6.73	x	16.15	x	0.4	x	0.8	=	24.1	(76)
East	0.9x	0.77	x	2.71	x	16.15	x	0.4	x	0.8	=	9.71	(76)
South	0.9x	0.77	x	2.24	x	46.75	x	0.4	x	0.8	=	23.22	(78)
South	0.9x	0.77	x	1.5	x	46.75	x	0.4	x	0.8	=	15.55	(78)
South	0.9x	0.77	x	2.71	x	46.75	x	0.4	x	0.8	=	28.1	(78)
South	0.9x	0.77	x	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	x	1.5	x	76.57	x	0.4	x	0.8	=	25.47	(78)
South	0.9x	0.77	x	2.71	x	76.57	x	0.4	x	0.8	=	46.01	(78)
South	0.9x	0.77	x	2.24	x	97.53	x	0.4	x	0.8	=	48.45	(78)
South	0.9x	0.77	x	1.5	x	97.53	x	0.4	x	0.8	=	32.44	(78)

South	0.9x	0.77	x	2.71	x	97.53	x	0.4	x	0.8	=	58.61	(78)
South	0.9x	0.77	x	2.24	x	110.23	x	0.4	x	0.8	=	54.76	(78)
South	0.9x	0.77	x	1.5	x	110.23	x	0.4	x	0.8	=	36.67	(78)
South	0.9x	0.77	x	2.71	x	110.23	x	0.4	x	0.8	=	66.25	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.4	x	0.8	=	57.06	(78)
South	0.9x	0.77	x	1.5	x	114.87	x	0.4	x	0.8	=	38.21	(78)
South	0.9x	0.77	x	2.71	x	114.87	x	0.4	x	0.8	=	69.03	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	x	1.5	x	110.55	x	0.4	x	0.8	=	36.77	(78)
South	0.9x	0.77	x	2.71	x	110.55	x	0.4	x	0.8	=	66.44	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	x	1.5	x	108.01	x	0.4	x	0.8	=	35.93	(78)
South	0.9x	0.77	x	2.71	x	108.01	x	0.4	x	0.8	=	64.91	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.4	x	0.8	=	52.11	(78)
South	0.9x	0.77	x	1.5	x	104.89	x	0.4	x	0.8	=	34.89	(78)
South	0.9x	0.77	x	2.71	x	104.89	x	0.4	x	0.8	=	63.04	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.4	x	0.8	=	50.61	(78)
South	0.9x	0.77	x	1.5	x	101.89	x	0.4	x	0.8	=	33.89	(78)
South	0.9x	0.77	x	2.71	x	101.89	x	0.4	x	0.8	=	61.23	(78)
South	0.9x	0.77	x	2.24	x	82.59	x	0.4	x	0.8	=	41.02	(78)
South	0.9x	0.77	x	1.5	x	82.59	x	0.4	x	0.8	=	27.47	(78)
South	0.9x	0.77	x	2.71	x	82.59	x	0.4	x	0.8	=	49.63	(78)
South	0.9x	0.77	x	2.24	x	55.42	x	0.4	x	0.8	=	27.53	(78)
South	0.9x	0.77	x	1.5	x	55.42	x	0.4	x	0.8	=	18.43	(78)
South	0.9x	0.77	x	2.71	x	55.42	x	0.4	x	0.8	=	33.3	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)
South	0.9x	0.77	x	1.5	x	40.4	x	0.4	x	0.8	=	13.44	(78)
South	0.9x	0.77	x	2.71	x	40.4	x	0.4	x	0.8	=	24.28	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	135	242.1	359.38	485.65	575.89	584.46	558.28	489.87	403.39	275.56	164.01	113.98	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	544.07	649.18	753.66	859.27	928.58	916.92	877.54	814.89	738.98	632	544.43	512.35	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.95	0.85	0.68	0.49	0.35	0.39	0.64	0.91	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.32	20.58	20.84	20.96	21	21	21	20.98	20.79	20.41	20.1	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.11	20.11	20.11	20.12	20.12	20.13	20.13	20.13	20.13	20.12	20.12	20.12	(88)

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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.94	0.82	0.62	0.42	0.28	0.32	0.56	0.88	0.98	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.96	19.24	19.6	19.94	20.09	20.13	20.13	20.13	20.11	19.9	19.37	18.91	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.44	19.68	19.99	20.3	20.44	20.48	20.48	20.48	20.46	20.26	19.79	19.39	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.44	19.68	19.99	20.3	20.44	20.48	20.48	20.48	20.46	20.26	19.79	19.39	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.94	0.83	0.65	0.45	0.31	0.35	0.59	0.89	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	539.13	634.08	705.93	711.18	599.16	410.35	272.13	285.41	438.71	559.95	532.81	508.91	(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=	1090.82	1062.5	968.39	810.04	619.72	412.38	272.31	285.78	448.3	684.49	903.07	1085.8	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	410.45	287.9	195.27	71.18	15.3	0	0	0	0	92.65	266.59	429.21	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1768.54 (98)

Space heating requirement in kWh/m²/year 23.77 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		**kWh/year**	
Annual space heating requirement		1768.54	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1945.39	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

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Water heating

Annual water heating requirement		2066.36	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2272.99	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	42.18	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		156.35	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	156.35	(331)
Energy for lighting (calculated in Appendix L)		326.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-769.49	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				319	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	686.31	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	21.89	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	708.21	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				708.21	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	81.14	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	169.42	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1		0.52		x 0.01 =	-399.36	(380)
Total CO2, kg/year	sum of (376)…(382) =				559.41	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				7.52	(384)
EI rating (section 14)					93.72	(385)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	John Simpson	**Stroma Number:**	STRO006273
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.26

Property Address: AC 410

Address : AC 410, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74.4	(1a) x	2.6	(2a) =	193.44	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74.4	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		193.44	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.16	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.41	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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	0.37	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.61	0.61	0.61	0.58	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=	0.61	0.61	0.61	0.58	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	
Windows Type 1			1.66	x1/[1/(1.4)+ 0.04]		=	2.2			(27)
Windows Type 2			2.01	x1/[1/(1.4)+ 0.04]		=	2.66			(27)
Windows Type 3			5	x1/[1/(1.4)+ 0.04]		=	6.63			(27)
Windows Type 4			1.66	x1/[1/(1.4)+ 0.04]		=	2.2			(27)
Windows Type 5			1.11	x1/[1/(1.4)+ 0.04]		=	1.47			(27)
Windows Type 6			2.01	x1/[1/(1.4)+ 0.04]		=	2.66			(27)
Windows Type 7			2.01	x1/[1/(1.4)+ 0.04]		=	2.66			(27)
Windows Type 8			2.01	x1/[1/(1.4)+ 0.04]		=	2.66			(27)
Windows Type 9			1.11	x1/[1/(1.4)+ 0.04]		=	1.47			(27)
Walls	66.82	18.58	48.24	x	0.18	=	8.68			(29)
Roof	74.4	0	74.4	x	0.13	=	9.67			(30)
Total area of elements, m²			141.22							(31)
Party wall			44.62	x	0	=	0			(32)

** 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) = 42.99 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 0 (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 8.05 (36) *if details of thermal bridging are not known (36) = 0.05 x (31)*

Total fabric heat loss (33) + (36) = 51.04 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.2	38.92	38.64	37.34	37.1	35.96	35.96	35.75	36.4	37.1	37.59	38.1	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	90.24	89.96	89.68	88.38	88.14	87	87	86.79	87.44	88.14	88.63	89.14	

Average = Sum(39)1…12 /12= 88.38 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.21	1.21	1.21	1.19	1.18	1.17	1.17	1.17	1.18	1.18	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 2.35 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.97 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96	

Total = Sum(44)1…12 = 1079.59 (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=	146.76	128.36	132.45	115.47	110.8	95.61	88.6	101.67	102.88	119.9	130.88	142.13	

Total = Sum(45)1…12 = 1415.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.01	19.25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (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) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	193.35	170.44	179.05	160.57	157.4	140.7	135.19	148.26	147.98	166.5	175.97	188.72	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	193.35	170.44	179.05	160.57	157.4	140.7	135.19	148.26	147.98	166.5	175.97	188.72

Output from water heater (annual)1…12 1964.13 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	86.07	76.35	81.32	74.47	74.12	67.86	66.74	71.08	70.28	77.14	79.59	84.53	(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=	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.96	158.39	169.93	184.5	198.19	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	(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=	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	(71)

Water heating gains (Table 5)

(72)m=	115.69	113.61	109.3	103.43	99.62	94.26	89.7	95.54	97.61	103.69	110.54	113.62	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	402.74	400.74	387.94	367.29	346.35	326.12	312.93	318.68	329.25	350.11	374.08	392.03	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.66	x	10.63	x	0.63	x	0.7	=	5.39	(74)
North	0.9x	0.77	x	2.01	x	10.63	x	0.63	x	0.7	=	6.53	(74)
North	0.9x	0.77	x	1.11	x	10.63	x	0.63	x	0.7	=	3.61	(74)
North	0.9x	0.77	x	1.66	x	20.32	x	0.63	x	0.7	=	10.31	(74)
North	0.9x	0.77	x	2.01	x	20.32	x	0.63	x	0.7	=	12.48	(74)
North	0.9x	0.77	x	1.11	x	20.32	x	0.63	x	0.7	=	6.89	(74)
North	0.9x	0.77	x	1.66	x	34.53	x	0.63	x	0.7	=	17.52	(74)
North	0.9x	0.77	x	2.01	x	34.53	x	0.63	x	0.7	=	21.21	(74)
North	0.9x	0.77	x	1.11	x	34.53	x	0.63	x	0.7	=	11.71	(74)
North	0.9x	0.77	x	1.66	x	55.46	x	0.63	x	0.7	=	28.14	(74)
North	0.9x	0.77	x	2.01	x	55.46	x	0.63	x	0.7	=	34.07	(74)
North	0.9x	0.77	x	1.11	x	55.46	x	0.63	x	0.7	=	18.82	(74)
North	0.9x	0.77	x	1.66	x	74.72	x	0.63	x	0.7	=	37.9	(74)
North	0.9x	0.77	x	2.01	x	74.72	x	0.63	x	0.7	=	45.9	(74)
North	0.9x	0.77	x	1.11	x	74.72	x	0.63	x	0.7	=	25.35	(74)
North	0.9x	0.77	x	1.66	x	79.99	x	0.63	x	0.7	=	40.58	(74)
North	0.9x	0.77	x	2.01	x	79.99	x	0.63	x	0.7	=	49.13	(74)
North	0.9x	0.77	x	1.11	x	79.99	x	0.63	x	0.7	=	27.13	(74)
North	0.9x	0.77	x	1.66	x	74.68	x	0.63	x	0.7	=	37.88	(74)
North	0.9x	0.77	x	2.01	x	74.68	x	0.63	x	0.7	=	45.87	(74)
North	0.9x	0.77	x	1.11	x	74.68	x	0.63	x	0.7	=	25.33	(74)
North	0.9x	0.77	x	1.66	x	59.25	x	0.63	x	0.7	=	30.06	(74)
North	0.9x	0.77	x	2.01	x	59.25	x	0.63	x	0.7	=	36.39	(74)
North	0.9x	0.77	x	1.11	x	59.25	x	0.63	x	0.7	=	20.1	(74)
North	0.9x	0.77	x	1.66	x	41.52	x	0.63	x	0.7	=	21.06	(74)
North	0.9x	0.77	x	2.01	x	41.52	x	0.63	x	0.7	=	25.5	(74)
North	0.9x	0.77	x	1.11	x	41.52	x	0.63	x	0.7	=	14.08	(74)
North	0.9x	0.77	x	1.66	x	24.19	x	0.63	x	0.7	=	12.27	(74)
North	0.9x	0.77	x	2.01	x	24.19	x	0.63	x	0.7	=	14.86	(74)
North	0.9x	0.77	x	1.11	x	24.19	x	0.63	x	0.7	=	8.21	(74)
North	0.9x	0.77	x	1.66	x	13.12	x	0.63	x	0.7	=	6.65	(74)
North	0.9x	0.77	x	2.01	x	13.12	x	0.63	x	0.7	=	8.06	(74)
North	0.9x	0.77	x	1.11	x	13.12	x	0.63	x	0.7	=	4.45	(74)
North	0.9x	0.77	x	1.66	x	8.86	x	0.63	x	0.7	=	4.5	(74)
North	0.9x	0.77	x	2.01	x	8.86	x	0.63	x	0.7	=	5.45	(74)
North	0.9x	0.77	x	1.11	x	8.86	x	0.63	x	0.7	=	3.01	(74)
East	0.9x	0.77	x	2.01	x	19.64	x	0.63	x	0.7	=	12.06	(76)
East	0.9x	0.77	x	5	x	19.64	x	0.63	x	0.7	=	30.01	(76)
East	0.9x	0.77	x	2.01	x	19.64	x	0.63	x	0.7	=	12.06	(76)

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East	0.9x	0.77	x	2.01	x	38.42	x	0.63	x	0.7	=	23.6	(76)
East	0.9x	0.77	x	5	x	38.42	x	0.63	x	0.7	=	58.71	(76)
East	0.9x	0.77	x	2.01	x	38.42	x	0.63	x	0.7	=	23.6	(76)
East	0.9x	0.77	x	2.01	x	63.27	x	0.63	x	0.7	=	38.87	(76)
East	0.9x	0.77	x	5	x	63.27	x	0.63	x	0.7	=	96.69	(76)
East	0.9x	0.77	x	2.01	x	63.27	x	0.63	x	0.7	=	38.87	(76)
East	0.9x	0.77	x	2.01	x	92.28	x	0.63	x	0.7	=	56.69	(76)
East	0.9x	0.77	x	5	x	92.28	x	0.63	x	0.7	=	141.01	(76)
East	0.9x	0.77	x	2.01	x	92.28	x	0.63	x	0.7	=	56.69	(76)
East	0.9x	0.77	x	2.01	x	113.09	x	0.63	x	0.7	=	69.47	(76)
East	0.9x	0.77	x	5	x	113.09	x	0.63	x	0.7	=	172.81	(76)
East	0.9x	0.77	x	2.01	x	113.09	x	0.63	x	0.7	=	69.47	(76)
East	0.9x	0.77	x	2.01	x	115.77	x	0.63	x	0.7	=	71.12	(76)
East	0.9x	0.77	x	5	x	115.77	x	0.63	x	0.7	=	176.9	(76)
East	0.9x	0.77	x	2.01	x	115.77	x	0.63	x	0.7	=	71.12	(76)
East	0.9x	0.77	x	2.01	x	110.22	x	0.63	x	0.7	=	67.71	(76)
East	0.9x	0.77	x	5	x	110.22	x	0.63	x	0.7	=	168.42	(76)
East	0.9x	0.77	x	2.01	x	110.22	x	0.63	x	0.7	=	67.71	(76)
East	0.9x	0.77	x	2.01	x	94.68	x	0.63	x	0.7	=	58.16	(76)
East	0.9x	0.77	x	5	x	94.68	x	0.63	x	0.7	=	144.67	(76)
East	0.9x	0.77	x	2.01	x	94.68	x	0.63	x	0.7	=	58.16	(76)
East	0.9x	0.77	x	2.01	x	73.59	x	0.63	x	0.7	=	45.2	(76)
East	0.9x	0.77	x	5	x	73.59	x	0.63	x	0.7	=	112.45	(76)
East	0.9x	0.77	x	2.01	x	73.59	x	0.63	x	0.7	=	45.2	(76)
East	0.9x	0.77	x	2.01	x	45.59	x	0.63	x	0.7	=	28	(76)
East	0.9x	0.77	x	5	x	45.59	x	0.63	x	0.7	=	69.66	(76)
East	0.9x	0.77	x	2.01	x	45.59	x	0.63	x	0.7	=	28	(76)
East	0.9x	0.77	x	2.01	x	24.49	x	0.63	x	0.7	=	15.04	(76)
East	0.9x	0.77	x	5	x	24.49	x	0.63	x	0.7	=	37.42	(76)
East	0.9x	0.77	x	2.01	x	24.49	x	0.63	x	0.7	=	15.04	(76)
East	0.9x	0.77	x	2.01	x	16.15	x	0.63	x	0.7	=	9.92	(76)
East	0.9x	0.77	x	5	x	16.15	x	0.63	x	0.7	=	24.68	(76)
East	0.9x	0.77	x	2.01	x	16.15	x	0.63	x	0.7	=	9.92	(76)
South	0.9x	0.77	x	1.66	x	46.75	x	0.63	x	0.7	=	23.72	(78)
South	0.9x	0.77	x	1.11	x	46.75	x	0.63	x	0.7	=	15.86	(78)
South	0.9x	0.77	x	2.01	x	46.75	x	0.63	x	0.7	=	28.72	(78)
South	0.9x	0.77	x	1.66	x	76.57	x	0.63	x	0.7	=	38.84	(78)
South	0.9x	0.77	x	1.11	x	76.57	x	0.63	x	0.7	=	25.97	(78)
South	0.9x	0.77	x	2.01	x	76.57	x	0.63	x	0.7	=	47.03	(78)
South	0.9x	0.77	x	1.66	x	97.53	x	0.63	x	0.7	=	49.48	(78)
South	0.9x	0.77	x	1.11	x	97.53	x	0.63	x	0.7	=	33.09	(78)

South	0.9x	0.77	x	2.01	x	97.53	x	0.63	x	0.7	=	59.91	(78)
South	0.9x	0.77	x	1.66	x	110.23	x	0.63	x	0.7	=	55.92	(78)
South	0.9x	0.77	x	1.11	x	110.23	x	0.63	x	0.7	=	37.39	(78)
South	0.9x	0.77	x	2.01	x	110.23	x	0.63	x	0.7	=	67.72	(78)
South	0.9x	0.77	x	1.66	x	114.87	x	0.63	x	0.7	=	58.28	(78)
South	0.9x	0.77	x	1.11	x	114.87	x	0.63	x	0.7	=	38.97	(78)
South	0.9x	0.77	x	2.01	x	114.87	x	0.63	x	0.7	=	70.56	(78)
South	0.9x	0.77	x	1.66	x	110.55	x	0.63	x	0.7	=	56.08	(78)
South	0.9x	0.77	x	1.11	x	110.55	x	0.63	x	0.7	=	37.5	(78)
South	0.9x	0.77	x	2.01	x	110.55	x	0.63	x	0.7	=	67.91	(78)
South	0.9x	0.77	x	1.66	x	108.01	x	0.63	x	0.7	=	54.8	(78)
South	0.9x	0.77	x	1.11	x	108.01	x	0.63	x	0.7	=	36.64	(78)
South	0.9x	0.77	x	2.01	x	108.01	x	0.63	x	0.7	=	66.35	(78)
South	0.9x	0.77	x	1.66	x	104.89	x	0.63	x	0.7	=	53.21	(78)
South	0.9x	0.77	x	1.11	x	104.89	x	0.63	x	0.7	=	35.58	(78)
South	0.9x	0.77	x	2.01	x	104.89	x	0.63	x	0.7	=	64.43	(78)
South	0.9x	0.77	x	1.66	x	101.89	x	0.63	x	0.7	=	51.69	(78)
South	0.9x	0.77	x	1.11	x	101.89	x	0.63	x	0.7	=	34.56	(78)
South	0.9x	0.77	x	2.01	x	101.89	x	0.63	x	0.7	=	62.59	(78)
South	0.9x	0.77	x	1.66	x	82.59	x	0.63	x	0.7	=	41.9	(78)
South	0.9x	0.77	x	1.11	x	82.59	x	0.63	x	0.7	=	28.02	(78)
South	0.9x	0.77	x	2.01	x	82.59	x	0.63	x	0.7	=	50.73	(78)
South	0.9x	0.77	x	1.66	x	55.42	x	0.63	x	0.7	=	28.11	(78)
South	0.9x	0.77	x	1.11	x	55.42	x	0.63	x	0.7	=	18.8	(78)
South	0.9x	0.77	x	2.01	x	55.42	x	0.63	x	0.7	=	34.04	(78)
South	0.9x	0.77	x	1.66	x	40.4	x	0.63	x	0.7	=	20.49	(78)
South	0.9x	0.77	x	1.11	x	40.4	x	0.63	x	0.7	=	13.7	(78)
South	0.9x	0.77	x	2.01	x	40.4	x	0.63	x	0.7	=	24.82	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	137.97	247.45	367.34	496.44	588.71	597.47	570.71	500.77	412.34	281.65	167.63	116.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	540.71	648.19	755.28	863.73	935.06	923.59	883.63	819.45	741.59	631.76	541.71	508.52	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.97	0.91	0.77	0.58	0.43	0.48	0.74	0.94	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.79	19.99	20.29	20.64	20.88	20.98	21	20.99	20.93	20.6	20.13	19.76	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.91	19.91	19.92	19.93	19.93	19.94	19.94	19.95	19.94	19.93	19.93	19.92	(88)

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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.96	0.88	0.71	0.49	0.33	0.37	0.65	0.92	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.32	18.61	19.04	19.53	19.82	19.93	19.94	19.94	19.89	19.49	18.82	18.28	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.91	19.17	19.54	19.98	20.25	20.35	20.37	20.37	20.31	19.94	19.35	18.88	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.91	19.17	19.54	19.98	20.25	20.35	20.37	20.37	20.31	19.94	19.35	18.88	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.95	0.88	0.73	0.53	0.37	0.42	0.68	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	536.33	636.12	720.38	758.35	683.1	489.27	326.39	341.71	505.91	581.03	532.47	505.37	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1318.75	1283.63	1169.84	979.16	753.44	500.56	327.91	344.42	542.87	822.97	1085.69	1308.57	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	582.12	435.12	334.39	158.99	52.33	0	0	0	0	180	398.32	597.58	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2738.86 (98)

Space heating requirement in kWh/m²/year 36.81 (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		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	582.12	435.12	334.39	158.99	52.33	0	0	0	0	180	398.32	597.58	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	622.59	465.37	357.64	170.04	55.97	0	0	0	0	192.52	426.01	639.12	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2929.26 (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)

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Water heating

Output from water heater (calculated above)

193.35	170.44	179.05	160.57	157.4	140.7	135.19	148.26	147.98	166.5	175.97	188.72

Efficiency of water heater 79.8 (216)

(217)m=	87.57	87.21	86.46	84.79	82.23	79.8	79.8	79.8	79.8	85.02	86.93	87.68	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	220.79	195.44	207.09	189.38	191.42	176.32	169.42	185.79	185.43	195.83	202.43	215.24

Total = Sum(219a)$_{1...12}$ = 2334.59 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2929.26	
Water heating fuel used		2334.59	
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		326.44	(232)

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	=	632.72	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	504.27	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1136.99	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	169.42	(268)
Total CO2, kg/year		sum of (265)…(271) =		1345.34	(272)

TER = 26.49 (273)