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:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 139.86m²

Site Reference : Maitland Park Estate **Plot Reference:** Grafton House

Address : Grafton House, 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
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	25.93 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.25 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	58.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
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:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi ECODAN 8.5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 2.00 kWh/day	
	Permitted by DBSCG: 2.56 kWh/day	**OK**
Primary pipework insulated:	Yes	**OK**

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6 Controls

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

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: South	5.34m²
Windows facing: South	1.5m²
Windows facing: East	1.86m²
Windows facing: North	3.72m²
Windows facing: West	1.86m²
Windows facing: South	7.08m²
Windows facing: South	4.5m²
Windows facing: North	5.07m²
Windows facing: North	4.54m²
Windows facing: South	5.31m²
Windows facing: North	4.54m²
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
Floors U-value	0.12 W/m²K

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: Grafton House

Address : Grafton House, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	40.01	(1a)	x	2.6	(2a)	=	104.03	(3a)
First floor	40.01	(1b)	x	3	(2b)	=	120.03	(3b)
Second floor	37.44	(1c)	x	3	(2c)	=	112.32	(3c)
Third floor	22.4	(1d)	x	3	(2d)	=	67.2	(3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.86	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			403.58	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							4	x 10 =	40	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40	÷ (5) =	0.1	(8)

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

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

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

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		2	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.2	(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) =	0.18	(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

0.23	0.23	0.23	0.2	0.2	0.17	0.17	0.17	0.18	0.2	0.21	0.22

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=	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.51	0.52	0.52	0.52	0.52	(24d)

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

(25)m=	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.51	0.52	0.52	0.52	0.52	(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			5.34	x1/[1/(1.4)+ 0.04]	=	7.08			(27)
Windows Type 2			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 3			0.93	x1/[1/(1.4)+ 0.04]	=	1.23			(27)
Windows Type 4			0.93	x1/[1/(1.4)+ 0.04]	=	1.23			(27)
Windows Type 5			0.93	x1/[1/(1.4)+ 0.04]	=	1.23			(27)
Windows Type 6			3.54	x1/[1/(1.4)+ 0.04]	=	4.69			(27)
Windows Type 7			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 8			1.69	x1/[1/(1.4)+ 0.04]	=	2.24			(27)
Windows Type 9			4.54	x1/[1/(1.4)+ 0.04]	=	6.02			(27)
Windows Type 10			5.31	x1/[1/(1.4)+ 0.04]	=	7.04			(27)
Windows Type 11			4.54	x1/[1/(1.4)+ 0.04]	=	6.02			(27)
Floor			40.01	x 0.12	=	4.8012			(28)
Walls	286.63	45.32	241.31	x 0.12	=	28.96			(29)
Roof	40.01	0	40.01	x 0.1	=	4			(30)

Total area of elements, m² 366.65 (31)

** 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) = 97.84 (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 33.07 (36)

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

Total fabric heat loss (33) + (36) = 130.91 (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=	70.26	70.12	69.98	69.32	69.2	68.63	68.63	68.52	68.85	69.2	69.45	69.71	(38)

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

(39)m=	201.18	201.03	200.89	200.24	200.12	199.54	199.54	199.44	199.76	200.12	200.36	200.62	

Average = $Sum(39)_{1…12}$ /12= 200.24 (39)

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

(40)m=	1.44	1.44	1.44	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	

Average = $Sum(40)_{1…12}$ /12= 1.43 (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 2.92 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 103.47 (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=	113.82	109.68	105.54	101.4	97.27	93.13	93.13	97.27	101.4	105.54	109.68	113.82	
											Total = $Sum(44)_{1…12}$ =	1241.69	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)													
(45)m=	168.79	147.63	152.34	132.81	127.44	109.97	101.9	116.93	118.33	137.9	150.53	163.47	
											Total = $Sum(45)_{1…12}$ =	1628.06	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	25.32	22.14	22.85	19.92	19.12	16.5	15.29	17.54	17.75	20.69	22.58	24.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 250 (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): 2 (48)

Temperature factor from Table 2b 0.54 (49)

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Energy lost from water storage, kWh/year	(48) x (49) =	1.08	(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)		1.08	(55)

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

(56)m=	33.48	30.24	33.48	32.4	33.48	32.4	33.48	33.48	32.4	33.48	32.4	33.48	(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=	33.48	30.24	33.48	32.4	33.48	32.4	33.48	33.48	32.4	33.48	32.4	33.48	(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=	225.54	198.88	209.08	187.73	184.18	164.88	158.64	173.68	173.24	194.65	205.44	220.21	(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=	225.54	198.88	209.08	187.73	184.18	164.88	158.64	173.68	173.24	194.65	205.44	220.21

Output from water heater (annual)1…12 | 2296.15 | (64)

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

(65)m=	101.52	90.09	96.05	88.09	87.77	80.49	79.28	84.27	83.27	91.25	93.98	99.75	(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=	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	(66)

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

(67)m=	27.57	24.49	19.91	15.08	11.27	9.51	10.28	13.36	17.94	22.77	26.58	28.34	(67)

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

(68)m=	309.25	312.46	304.38	287.16	265.43	245	231.36	228.15	236.24	253.45	275.18	295.61	(68)

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

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	(71)

Water heating gains (Table 5)

(72)m=	136.45	134.06	129.1	122.35	117.97	111.8	106.55	113.27	115.66	122.64	130.53	134.07	(72)

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

(73)m=	540.02	537.76	520.14	491.34	461.42	433.07	414.95	421.54	436.58	465.62	499.05	524.77	(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	0.93	x	10.63	x	0.4	x	0.8	=	8.77	(74)
North	0.9x	0.77	x	1.69	x	10.63	x	0.4	x	0.8	=	11.96	(74)
North	0.9x	0.77	x	4.54	x	10.63	x	0.4	x	0.8	=	10.71	(74)
North	0.9x	0.77	x	4.54	x	10.63	x	0.4	x	0.8	=	10.71	(74)
North	0.9x	0.77	x	0.93	x	20.32	x	0.4	x	0.8	=	16.76	(74)
North	0.9x	0.77	x	1.69	x	20.32	x	0.4	x	0.8	=	22.85	(74)
North	0.9x	0.77	x	4.54	x	20.32	x	0.4	x	0.8	=	20.46	(74)
North	0.9x	0.77	x	4.54	x	20.32	x	0.4	x	0.8	=	20.46	(74)
North	0.9x	0.77	x	0.93	x	34.53	x	0.4	x	0.8	=	28.49	(74)
North	0.9x	0.77	x	1.69	x	34.53	x	0.4	x	0.8	=	38.82	(74)
North	0.9x	0.77	x	4.54	x	34.53	x	0.4	x	0.8	=	34.76	(74)
North	0.9x	0.77	x	4.54	x	34.53	x	0.4	x	0.8	=	34.76	(74)
North	0.9x	0.77	x	0.93	x	55.46	x	0.4	x	0.8	=	45.76	(74)
North	0.9x	0.77	x	1.69	x	55.46	x	0.4	x	0.8	=	62.36	(74)
North	0.9x	0.77	x	4.54	x	55.46	x	0.4	x	0.8	=	55.84	(74)
North	0.9x	0.77	x	4.54	x	55.46	x	0.4	x	0.8	=	55.84	(74)
North	0.9x	0.77	x	0.93	x	74.72	x	0.4	x	0.8	=	61.64	(74)
North	0.9x	0.77	x	1.69	x	74.72	x	0.4	x	0.8	=	84	(74)
North	0.9x	0.77	x	4.54	x	74.72	x	0.4	x	0.8	=	75.22	(74)
North	0.9x	0.77	x	4.54	x	74.72	x	0.4	x	0.8	=	75.22	(74)
North	0.9x	0.77	x	0.93	x	79.99	x	0.4	x	0.8	=	65.98	(74)
North	0.9x	0.77	x	1.69	x	79.99	x	0.4	x	0.8	=	89.93	(74)
North	0.9x	0.77	x	4.54	x	79.99	x	0.4	x	0.8	=	80.53	(74)
North	0.9x	0.77	x	4.54	x	79.99	x	0.4	x	0.8	=	80.53	(74)
North	0.9x	0.77	x	0.93	x	74.68	x	0.4	x	0.8	=	61.6	(74)
North	0.9x	0.77	x	1.69	x	74.68	x	0.4	x	0.8	=	83.96	(74)
North	0.9x	0.77	x	4.54	x	74.68	x	0.4	x	0.8	=	75.18	(74)
North	0.9x	0.77	x	4.54	x	74.68	x	0.4	x	0.8	=	75.18	(74)
North	0.9x	0.77	x	0.93	x	59.25	x	0.4	x	0.8	=	48.88	(74)
North	0.9x	0.77	x	1.69	x	59.25	x	0.4	x	0.8	=	66.61	(74)
North	0.9x	0.77	x	4.54	x	59.25	x	0.4	x	0.8	=	59.65	(74)
North	0.9x	0.77	x	4.54	x	59.25	x	0.4	x	0.8	=	59.65	(74)

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North	0.9x	0.77	x	0.93	x	41.52	x	0.4	x	0.8	=	34.25	(74)
North	0.9x	0.77	x	1.69	x	41.52	x	0.4	x	0.8	=	46.68	(74)
North	0.9x	0.77	x	4.54	x	41.52	x	0.4	x	0.8	=	41.8	(74)
North	0.9x	0.77	x	4.54	x	41.52	x	0.4	x	0.8	=	41.8	(74)
North	0.9x	0.77	x	0.93	x	24.19	x	0.4	x	0.8	=	19.96	(74)
North	0.9x	0.77	x	1.69	x	24.19	x	0.4	x	0.8	=	27.2	(74)
North	0.9x	0.77	x	4.54	x	24.19	x	0.4	x	0.8	=	24.35	(74)
North	0.9x	0.77	x	4.54	x	24.19	x	0.4	x	0.8	=	24.35	(74)
North	0.9x	0.77	x	0.93	x	13.12	x	0.4	x	0.8	=	10.82	(74)
North	0.9x	0.77	x	1.69	x	13.12	x	0.4	x	0.8	=	14.75	(74)
North	0.9x	0.77	x	4.54	x	13.12	x	0.4	x	0.8	=	13.21	(74)
North	0.9x	0.77	x	4.54	x	13.12	x	0.4	x	0.8	=	13.21	(74)
North	0.9x	0.77	x	0.93	x	8.86	x	0.4	x	0.8	=	7.31	(74)
North	0.9x	0.77	x	1.69	x	8.86	x	0.4	x	0.8	=	9.97	(74)
North	0.9x	0.77	x	4.54	x	8.86	x	0.4	x	0.8	=	8.92	(74)
North	0.9x	0.77	x	4.54	x	8.86	x	0.4	x	0.8	=	8.92	(74)
East	0.9x	0.77	x	0.93	x	19.64	x	0.4	x	0.8	=	8.1	(76)
East	0.9x	0.77	x	0.93	x	38.42	x	0.4	x	0.8	=	15.85	(76)
East	0.9x	0.77	x	0.93	x	63.27	x	0.4	x	0.8	=	26.1	(76)
East	0.9x	0.77	x	0.93	x	92.28	x	0.4	x	0.8	=	38.06	(76)
East	0.9x	0.77	x	0.93	x	113.09	x	0.4	x	0.8	=	46.65	(76)
East	0.9x	0.77	x	0.93	x	115.77	x	0.4	x	0.8	=	47.75	(76)
East	0.9x	0.77	x	0.93	x	110.22	x	0.4	x	0.8	=	45.46	(76)
East	0.9x	0.77	x	0.93	x	94.68	x	0.4	x	0.8	=	39.05	(76)
East	0.9x	0.77	x	0.93	x	73.59	x	0.4	x	0.8	=	30.35	(76)
East	0.9x	0.77	x	0.93	x	45.59	x	0.4	x	0.8	=	18.8	(76)
East	0.9x	0.77	x	0.93	x	24.49	x	0.4	x	0.8	=	10.1	(76)
East	0.9x	0.77	x	0.93	x	16.15	x	0.4	x	0.8	=	6.66	(76)
South	0.9x	0.77	x	5.34	x	46.75	x	0.4	x	0.8	=	55.36	(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	3.54	x	46.75	x	0.4	x	0.8	=	73.4	(78)
South	0.9x	0.77	x	1.5	x	46.75	x	0.4	x	0.8	=	46.65	(78)
South	0.9x	0.77	x	5.31	x	46.75	x	0.4	x	0.8	=	55.05	(78)
South	0.9x	0.77	x	5.34	x	76.57	x	0.4	x	0.8	=	90.67	(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	3.54	x	76.57	x	0.4	x	0.8	=	120.22	(78)
South	0.9x	0.77	x	1.5	x	76.57	x	0.4	x	0.8	=	76.41	(78)
South	0.9x	0.77	x	5.31	x	76.57	x	0.4	x	0.8	=	90.16	(78)
South	0.9x	0.77	x	5.34	x	97.53	x	0.4	x	0.8	=	115.5	(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	3.54	x	97.53	x	0.4	x	0.8	=	153.13	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.5	x	97.53	x	0.4	x	0.8	=	97.33	(78)
South	0.9x	0.77	x	5.31	x	97.53	x	0.4	x	0.8	=	114.85	(78)
South	0.9x	0.77	x	5.34	x	110.23	x	0.4	x	0.8	=	130.54	(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	3.54	x	110.23	x	0.4	x	0.8	=	173.07	(78)
South	0.9x	0.77	x	1.5	x	110.23	x	0.4	x	0.8	=	110.01	(78)
South	0.9x	0.77	x	5.31	x	110.23	x	0.4	x	0.8	=	129.81	(78)
South	0.9x	0.77	x	5.34	x	114.87	x	0.4	x	0.8	=	136.03	(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	3.54	x	114.87	x	0.4	x	0.8	=	180.35	(78)
South	0.9x	0.77	x	1.5	x	114.87	x	0.4	x	0.8	=	114.63	(78)
South	0.9x	0.77	x	5.31	x	114.87	x	0.4	x	0.8	=	135.27	(78)
South	0.9x	0.77	x	5.34	x	110.55	x	0.4	x	0.8	=	130.91	(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	3.54	x	110.55	x	0.4	x	0.8	=	173.57	(78)
South	0.9x	0.77	x	1.5	x	110.55	x	0.4	x	0.8	=	110.32	(78)
South	0.9x	0.77	x	5.31	x	110.55	x	0.4	x	0.8	=	130.18	(78)
South	0.9x	0.77	x	5.34	x	108.01	x	0.4	x	0.8	=	127.91	(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	3.54	x	108.01	x	0.4	x	0.8	=	169.59	(78)
South	0.9x	0.77	x	1.5	x	108.01	x	0.4	x	0.8	=	107.79	(78)
South	0.9x	0.77	x	5.31	x	108.01	x	0.4	x	0.8	=	127.19	(78)
South	0.9x	0.77	x	5.34	x	104.89	x	0.4	x	0.8	=	124.22	(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	3.54	x	104.89	x	0.4	x	0.8	=	164.69	(78)
South	0.9x	0.77	x	1.5	x	104.89	x	0.4	x	0.8	=	104.68	(78)
South	0.9x	0.77	x	5.31	x	104.89	x	0.4	x	0.8	=	123.52	(78)
South	0.9x	0.77	x	5.34	x	101.89	x	0.4	x	0.8	=	120.65	(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	3.54	x	101.89	x	0.4	x	0.8	=	159.97	(78)
South	0.9x	0.77	x	1.5	x	101.89	x	0.4	x	0.8	=	101.67	(78)
South	0.9x	0.77	x	5.31	x	101.89	x	0.4	x	0.8	=	119.97	(78)
South	0.9x	0.77	x	5.34	x	82.59	x	0.4	x	0.8	=	97.8	(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	3.54	x	82.59	x	0.4	x	0.8	=	129.66	(78)
South	0.9x	0.77	x	1.5	x	82.59	x	0.4	x	0.8	=	82.41	(78)
South	0.9x	0.77	x	5.31	x	82.59	x	0.4	x	0.8	=	97.25	(78)
South	0.9x	0.77	x	5.34	x	55.42	x	0.4	x	0.8	=	65.62	(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	3.54	x	55.42	x	0.4	x	0.8	=	87.01	(78)
South	0.9x	0.77	x	1.5	x	55.42	x	0.4	x	0.8	=	55.3	(78)

South	0.9x	0.77	x	5.31	x	55.42	x	0.4	x	0.8	=	65.26	(78)
South	0.9x	0.77	x	5.34	x	40.4	x	0.4	x	0.8	=	47.84	(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	3.54	x	40.4	x	0.4	x	0.8	=	63.43	(78)
South	0.9x	0.77	x	1.5	x	40.4	x	0.4	x	0.8	=	40.31	(78)
South	0.9x	0.77	x	5.31	x	40.4	x	0.4	x	0.8	=	47.57	(78)
West	0.9x	0.77	x	0.93	x	19.64	x	0.4	x	0.8	=	8.1	(80)
West	0.9x	0.77	x	0.93	x	38.42	x	0.4	x	0.8	=	15.85	(80)
West	0.9x	0.77	x	0.93	x	63.27	x	0.4	x	0.8	=	26.1	(80)
West	0.9x	0.77	x	0.93	x	92.28	x	0.4	x	0.8	=	38.06	(80)
West	0.9x	0.77	x	0.93	x	113.09	x	0.4	x	0.8	=	46.65	(80)
West	0.9x	0.77	x	0.93	x	115.77	x	0.4	x	0.8	=	47.75	(80)
West	0.9x	0.77	x	0.93	x	110.22	x	0.4	x	0.8	=	45.46	(80)
West	0.9x	0.77	x	0.93	x	94.68	x	0.4	x	0.8	=	39.05	(80)
West	0.9x	0.77	x	0.93	x	73.59	x	0.4	x	0.8	=	30.35	(80)
West	0.9x	0.77	x	0.93	x	45.59	x	0.4	x	0.8	=	18.8	(80)
West	0.9x	0.77	x	0.93	x	24.49	x	0.4	x	0.8	=	10.1	(80)
West	0.9x	0.77	x	0.93	x	16.15	x	0.4	x	0.8	=	6.66	(80)

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

(83)m=	304.37	515.15	702.29	876.02	993.88	994.22	955.25	864.88	761.39	568.06	363.81	261.04	(83)

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

(84)m=	844.39	1052.91	1222.43	1367.35	1455.29	1427.28	1370.2	1286.42	1197.97	1033.68	862.86	785.81	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.99	0.96	0.89	0.76	0.6	0.65	0.86	0.97	1	1	(86)

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

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

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

(88)m=	19.73	19.73	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	(88)

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

(89)m=	1	0.99	0.98	0.94	0.85	0.66	0.45	0.5	0.78	0.96	0.99	1	(89)

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

(90)m=	19.73	19.73	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	19.74	(90)

fLA = Living area ÷ (4) = 0.11 (91)

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

(92)m=	19.88	19.88	19.88	19.88	19.88	19.89	19.89	19.89	19.88	19.88	19.88	19.88	(92)

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

(93)m=	19.88	19.88	19.88	19.88	19.88	19.89	19.89	19.89	19.88	19.88	19.88	19.88	(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=	1	0.99	0.98	0.94	0.85	0.67	0.47	0.52	0.79	0.96	0.99	1	(94)

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

(95)m=	841.95	1044.76	1198.12	1291.9	1242.08	958.89	640.38	670.91	951.62	993.53	857.11	784.13	(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=	3133.92	3011.22	2687.83	2199.11	1637.55	1054.75	655.66	695.3	1155.58	1857.68	2561.02	3145.9	(97)

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

(98)m=	1705.23	1321.46	1108.35	653.19	294.24	0	0	0	0	642.92	1226.82	1757.15

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 8709.35 (98)

Space heating requirement in kWh/m²/year 62.27 (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		389.44	(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)	1705.23	1321.46	1108.35	653.19	294.24	0	0	0	0	642.92	1226.82	1757.15		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	437.87	339.32	284.6	167.72	75.55	0	0	0	0	165.09	315.02	451.2		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2236.37	(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)	225.54	198.88	209.08	187.73	184.18	164.88	158.64	173.68	173.24	194.65	205.44	220.21		
Efficiency of water heater													119.34	(216)
(217)m=	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	188.99	166.65	175.2	157.3	154.33	138.16	132.94	145.53	145.17	163.1	172.15	184.52		
Total = Sum(219a)$_{1...12}$ =													1924.04	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2236.37
Water heating fuel used		1924.04
Electricity for pumps, fans and electric keep-hot		

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Total electricity for the above, kWh/year	sum of (230a)…(230g) =	0	(231)
Electricity for lighting		486.9	(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	0.519	=	1160.68	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	998.58	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2159.26	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	0	(267)
Electricity for lighting	(232)	x	0.519	=	252.7	(268)
Total CO2, kg/year			sum of (265)…(271) =		2411.95	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =		17.25	(273)
EI rating (section 14)					83	(274)

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: Grafton House

Address : Grafton House, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	40.01	(1a)	x	2.6	(2a)	=	104.03	(3a)
First floor	40.01	(1b)	x	3	(2b)	=	120.03	(3b)
Second floor	37.44	(1c)	x	3	(2c)	=	112.32	(3c)
Third floor	22.4	(1d)	x	3	(2d)	=	67.2	(3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.86	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			403.58	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							4	x 10 =	40	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40	÷ (5) =	0.1	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.35	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(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

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Monthly average wind speed from Table 7

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

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	0.4	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=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	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=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	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	
Windows Type 1			4.12	x1/[1/(1.4)+ 0.04]	=	5.46			(27)
Windows Type 2			1.16	x1/[1/(1.4)+ 0.04]	=	1.54			(27)
Windows Type 3			0.72	x1/[1/(1.4)+ 0.04]	=	0.95			(27)
Windows Type 4			0.72	x1/[1/(1.4)+ 0.04]	=	0.95			(27)
Windows Type 5			0.72	x1/[1/(1.4)+ 0.04]	=	0.95			(27)
Windows Type 6			2.73	x1/[1/(1.4)+ 0.04]	=	3.62			(27)
Windows Type 7			1.16	x1/[1/(1.4)+ 0.04]	=	1.54			(27)
Windows Type 8			1.3	x1/[1/(1.4)+ 0.04]	=	1.72			(27)
Windows Type 9			3.5	x1/[1/(1.4)+ 0.04]	=	4.64			(27)
Windows Type 10			4.1	x1/[1/(1.4)+ 0.04]	=	5.44			(27)
Windows Type 11			3.5	x1/[1/(1.4)+ 0.04]	=	4.64			(27)
Floor			40.01	x 0.13	=	5.2013			(28)
Walls	286.63	34.98	251.65	x 0.18	=	45.3			(29)
Roof	40.01	0	40.01	x 0.13	=	5.2			(30)

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Total area of elements, m² | 366.65 | (31)

** 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) =	102.07	(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 | 17.51 | (36)

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

Total fabric heat loss | (33) + (36) = | 119.58 | (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=	77.88	77.44	77.01	74.99	74.62	72.86	72.86	72.53	73.53	74.62	75.38	76.18	(38)

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

(39)m=	197.46	197.02	196.59	194.57	194.2	192.44	192.44	192.11	193.11	194.2	194.96	195.76	

Average = Sum(39)$_{1…12}$ /12= | 194.57 | (39)

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

(40)m=	1.41	1.41	1.41	1.39	1.39	1.38	1.38	1.37	1.38	1.39	1.39	1.4	

Average = Sum(40)$_{1…12}$ /12= | 1.39 | (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N | 2.92 | (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 | 103.47 | (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=	113.82	109.68	105.54	101.4	97.27	93.13	93.13	97.27	101.4	105.54	109.68	113.82	

Total = Sum(44)$_{1…12}$ = | 1241.69 | (44)

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

(45)m=	168.79	147.63	152.34	132.81	127.44	109.97	101.9	116.93	118.33	137.9	150.53	163.47	

Total = Sum(45)$_{1…12}$ = | 1628.06 | (45)

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

(46)m=	25.32	22.14	22.85	19.92	19.12	16.5	15.29	17.54	17.75	20.69	22.58	24.52	(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): | 1.89 | (48)

Temperature factor from Table 2b | 0.54 | (49)

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Energy lost from water storage, kWh/year	(48) x (49) =	1.02	(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)		1.02	(55)

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

(56)m=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64	(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=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64	(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=	223.7	197.22	207.25	185.95	182.34	163.1	156.81	171.84	171.47	192.81	203.67	218.38	(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=	223.7	197.22	207.25	185.95	182.34	163.1	156.81	171.84	171.47	192.81	203.67	218.38

Output from water heater (annual)$_{1...12}$ — 2274.54 (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=	100.05	88.76	94.58	86.67	86.3	79.07	77.81	82.81	81.85	89.78	92.56	98.28	(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=	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	145.84	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	27.57	24.49	19.91	15.08	11.27	9.51	10.28	13.36	17.94	22.77	26.58	28.34	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	309.25	312.46	304.38	287.16	265.43	245	231.36	228.15	236.24	253.45	275.18	295.61	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(69)
Pumps and fans gains (Table 5a)													
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	-116.67	(71)

Water heating gains (Table 5)

(72)m=	134.48	132.09	127.12	120.37	115.99	109.82	104.58	111.3	113.69	120.67	128.56	132.1	(72)

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

(73)m=	541.05	538.79	521.16	492.36	462.44	434.09	415.97	422.56	437.61	466.65	500.07	525.79	(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	0.72	x	10.63	x	0.63	x	0.7	=	9.36	(74)
North	0.9x	0.77	x	1.3	x	10.63	x	0.63	x	0.7	=	12.67	(74)
North	0.9x	0.77	x	3.5	x	10.63	x	0.63	x	0.7	=	11.37	(74)
North	0.9x	0.77	x	3.5	x	10.63	x	0.63	x	0.7	=	11.37	(74)
North	0.9x	0.77	x	0.72	x	20.32	x	0.63	x	0.7	=	17.89	(74)
North	0.9x	0.77	x	1.3	x	20.32	x	0.63	x	0.7	=	24.22	(74)
North	0.9x	0.77	x	3.5	x	20.32	x	0.63	x	0.7	=	21.74	(74)
North	0.9x	0.77	x	3.5	x	20.32	x	0.63	x	0.7	=	21.74	(74)
North	0.9x	0.77	x	0.72	x	34.53	x	0.63	x	0.7	=	30.39	(74)
North	0.9x	0.77	x	1.3	x	34.53	x	0.63	x	0.7	=	41.16	(74)
North	0.9x	0.77	x	3.5	x	34.53	x	0.63	x	0.7	=	36.94	(74)
North	0.9x	0.77	x	3.5	x	34.53	x	0.63	x	0.7	=	36.94	(74)
North	0.9x	0.77	x	0.72	x	55.46	x	0.63	x	0.7	=	48.82	(74)
North	0.9x	0.77	x	1.3	x	55.46	x	0.63	x	0.7	=	66.11	(74)
North	0.9x	0.77	x	3.5	x	55.46	x	0.63	x	0.7	=	59.33	(74)
North	0.9x	0.77	x	3.5	x	55.46	x	0.63	x	0.7	=	59.33	(74)
North	0.9x	0.77	x	0.72	x	74.72	x	0.63	x	0.7	=	65.76	(74)
North	0.9x	0.77	x	1.3	x	74.72	x	0.63	x	0.7	=	89.05	(74)
North	0.9x	0.77	x	3.5	x	74.72	x	0.63	x	0.7	=	79.92	(74)
North	0.9x	0.77	x	3.5	x	74.72	x	0.63	x	0.7	=	79.92	(74)
North	0.9x	0.77	x	0.72	x	79.99	x	0.63	x	0.7	=	70.4	(74)
North	0.9x	0.77	x	1.3	x	79.99	x	0.63	x	0.7	=	95.33	(74)
North	0.9x	0.77	x	3.5	x	79.99	x	0.63	x	0.7	=	85.56	(74)
North	0.9x	0.77	x	3.5	x	79.99	x	0.63	x	0.7	=	85.56	(74)
North	0.9x	0.77	x	0.72	x	74.68	x	0.63	x	0.7	=	65.73	(74)
North	0.9x	0.77	x	1.3	x	74.68	x	0.63	x	0.7	=	89.01	(74)
North	0.9x	0.77	x	3.5	x	74.68	x	0.63	x	0.7	=	79.88	(74)
North	0.9x	0.77	x	3.5	x	74.68	x	0.63	x	0.7	=	79.88	(74)
North	0.9x	0.77	x	0.72	x	59.25	x	0.63	x	0.7	=	52.15	(74)
North	0.9x	0.77	x	1.3	x	59.25	x	0.63	x	0.7	=	70.62	(74)
North	0.9x	0.77	x	3.5	x	59.25	x	0.63	x	0.7	=	63.37	(74)
North	0.9x	0.77	x	3.5	x	59.25	x	0.63	x	0.7	=	63.37	(74)

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North	0.9x	0.77	x	0.72	x	41.52	x	0.63	x	0.7	=	36.54	(74)
North	0.9x	0.77	x	1.3	x	41.52	x	0.63	x	0.7	=	49.48	(74)
North	0.9x	0.77	x	3.5	x	41.52	x	0.63	x	0.7	=	44.41	(74)
North	0.9x	0.77	x	3.5	x	41.52	x	0.63	x	0.7	=	44.41	(74)
North	0.9x	0.77	x	0.72	x	24.19	x	0.63	x	0.7	=	21.29	(74)
North	0.9x	0.77	x	1.3	x	24.19	x	0.63	x	0.7	=	28.83	(74)
North	0.9x	0.77	x	3.5	x	24.19	x	0.63	x	0.7	=	25.87	(74)
North	0.9x	0.77	x	3.5	x	24.19	x	0.63	x	0.7	=	25.87	(74)
North	0.9x	0.77	x	0.72	x	13.12	x	0.63	x	0.7	=	11.55	(74)
North	0.9x	0.77	x	1.3	x	13.12	x	0.63	x	0.7	=	15.63	(74)
North	0.9x	0.77	x	3.5	x	13.12	x	0.63	x	0.7	=	14.03	(74)
North	0.9x	0.77	x	3.5	x	13.12	x	0.63	x	0.7	=	14.03	(74)
North	0.9x	0.77	x	0.72	x	8.86	x	0.63	x	0.7	=	7.8	(74)
North	0.9x	0.77	x	1.3	x	8.86	x	0.63	x	0.7	=	10.57	(74)
North	0.9x	0.77	x	3.5	x	8.86	x	0.63	x	0.7	=	9.48	(74)
North	0.9x	0.77	x	3.5	x	8.86	x	0.63	x	0.7	=	9.48	(74)
East	0.9x	0.77	x	0.72	x	19.64	x	0.63	x	0.7	=	8.64	(76)
East	0.9x	0.77	x	0.72	x	38.42	x	0.63	x	0.7	=	16.91	(76)
East	0.9x	0.77	x	0.72	x	63.27	x	0.63	x	0.7	=	27.85	(76)
East	0.9x	0.77	x	0.72	x	92.28	x	0.63	x	0.7	=	40.61	(76)
East	0.9x	0.77	x	0.72	x	113.09	x	0.63	x	0.7	=	49.77	(76)
East	0.9x	0.77	x	0.72	x	115.77	x	0.63	x	0.7	=	50.95	(76)
East	0.9x	0.77	x	0.72	x	110.22	x	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	x	0.72	x	94.68	x	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	x	0.72	x	73.59	x	0.63	x	0.7	=	32.39	(76)
East	0.9x	0.77	x	0.72	x	45.59	x	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	x	0.72	x	24.49	x	0.63	x	0.7	=	10.78	(76)
East	0.9x	0.77	x	0.72	x	16.15	x	0.63	x	0.7	=	7.11	(76)
South	0.9x	0.77	x	4.12	x	46.75	x	0.63	x	0.7	=	58.87	(78)
South	0.9x	0.77	x	1.16	x	46.75	x	0.63	x	0.7	=	16.57	(78)
South	0.9x	0.77	x	2.73	x	46.75	x	0.63	x	0.7	=	78.01	(78)
South	0.9x	0.77	x	1.16	x	46.75	x	0.63	x	0.7	=	49.72	(78)
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	4.12	x	76.57	x	0.63	x	0.7	=	96.41	(78)
South	0.9x	0.77	x	1.16	x	76.57	x	0.63	x	0.7	=	27.14	(78)
South	0.9x	0.77	x	2.73	x	76.57	x	0.63	x	0.7	=	127.76	(78)
South	0.9x	0.77	x	1.16	x	76.57	x	0.63	x	0.7	=	81.43	(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	4.12	x	97.53	x	0.63	x	0.7	=	122.81	(78)
South	0.9x	0.77	x	1.16	x	97.53	x	0.63	x	0.7	=	34.58	(78)
South	0.9x	0.77	x	2.73	x	97.53	x	0.63	x	0.7	=	162.75	(78)

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South	0.9x	0.77	x	1.16	x	97.53	x	0.63	x	0.7	=	103.73	(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	4.12	x	110.23	x	0.63	x	0.7	=	138.8	(78)
South	0.9x	0.77	x	1.16	x	110.23	x	0.63	x	0.7	=	39.08	(78)
South	0.9x	0.77	x	2.73	x	110.23	x	0.63	x	0.7	=	183.94	(78)
South	0.9x	0.77	x	1.16	x	110.23	x	0.63	x	0.7	=	117.24	(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	4.12	x	114.87	x	0.63	x	0.7	=	144.64	(78)
South	0.9x	0.77	x	1.16	x	114.87	x	0.63	x	0.7	=	40.72	(78)
South	0.9x	0.77	x	2.73	x	114.87	x	0.63	x	0.7	=	191.68	(78)
South	0.9x	0.77	x	1.16	x	114.87	x	0.63	x	0.7	=	122.17	(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	4.12	x	110.55	x	0.63	x	0.7	=	139.19	(78)
South	0.9x	0.77	x	1.16	x	110.55	x	0.63	x	0.7	=	39.19	(78)
South	0.9x	0.77	x	2.73	x	110.55	x	0.63	x	0.7	=	184.47	(78)
South	0.9x	0.77	x	1.16	x	110.55	x	0.63	x	0.7	=	117.57	(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	4.12	x	108.01	x	0.63	x	0.7	=	136	(78)
South	0.9x	0.77	x	1.16	x	108.01	x	0.63	x	0.7	=	38.29	(78)
South	0.9x	0.77	x	2.73	x	108.01	x	0.63	x	0.7	=	180.23	(78)
South	0.9x	0.77	x	1.16	x	108.01	x	0.63	x	0.7	=	114.87	(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	4.12	x	104.89	x	0.63	x	0.7	=	132.08	(78)
South	0.9x	0.77	x	1.16	x	104.89	x	0.63	x	0.7	=	37.19	(78)
South	0.9x	0.77	x	2.73	x	104.89	x	0.63	x	0.7	=	175.03	(78)
South	0.9x	0.77	x	1.16	x	104.89	x	0.63	x	0.7	=	111.56	(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	4.12	x	101.89	x	0.63	x	0.7	=	128.29	(78)
South	0.9x	0.77	x	1.16	x	101.89	x	0.63	x	0.7	=	36.12	(78)
South	0.9x	0.77	x	2.73	x	101.89	x	0.63	x	0.7	=	170.01	(78)
South	0.9x	0.77	x	1.16	x	101.89	x	0.63	x	0.7	=	108.36	(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	4.12	x	82.59	x	0.63	x	0.7	=	103.99	(78)
South	0.9x	0.77	x	1.16	x	82.59	x	0.63	x	0.7	=	29.28	(78)
South	0.9x	0.77	x	2.73	x	82.59	x	0.63	x	0.7	=	137.81	(78)
South	0.9x	0.77	x	1.16	x	82.59	x	0.63	x	0.7	=	87.83	(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	4.12	x	55.42	x	0.63	x	0.7	=	69.78	(78)
South	0.9x	0.77	x	1.16	x	55.42	x	0.63	x	0.7	=	19.65	(78)
South	0.9x	0.77	x	2.73	x	55.42	x	0.63	x	0.7	=	92.47	(78)
South	0.9x	0.77	x	1.16	x	55.42	x	0.63	x	0.7	=	58.94	(78)

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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	4.12	x	40.4	x	0.63	x	0.7	=	50.87	(78)
South	0.9x	0.77	x	1.16	x	40.4	x	0.63	x	0.7	=	14.32	(78)
South	0.9x	0.77	x	2.73	x	40.4	x	0.63	x	0.7	=	67.41	(78)
South	0.9x	0.77	x	1.16	x	40.4	x	0.63	x	0.7	=	42.96	(78)
South	0.9x	0.77	x	4.1	x	40.4	x	0.63	x	0.7	=	50.62	(78)
West	0.9x	0.77	x	0.72	x	19.64	x	0.63	x	0.7	=	8.64	(80)
West	0.9x	0.77	x	0.72	x	38.42	x	0.63	x	0.7	=	16.91	(80)
West	0.9x	0.77	x	0.72	x	63.27	x	0.63	x	0.7	=	27.85	(80)
West	0.9x	0.77	x	0.72	x	92.28	x	0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77	x	0.72	x	113.09	x	0.63	x	0.7	=	49.77	(80)
West	0.9x	0.77	x	0.72	x	115.77	x	0.63	x	0.7	=	50.95	(80)
West	0.9x	0.77	x	0.72	x	110.22	x	0.63	x	0.7	=	48.51	(80)
West	0.9x	0.77	x	0.72	x	94.68	x	0.63	x	0.7	=	41.67	(80)
West	0.9x	0.77	x	0.72	x	73.59	x	0.63	x	0.7	=	32.39	(80)
West	0.9x	0.77	x	0.72	x	45.59	x	0.63	x	0.7	=	20.06	(80)
West	0.9x	0.77	x	0.72	x	24.49	x	0.63	x	0.7	=	10.78	(80)
West	0.9x	0.77	x	0.72	x	16.15	x	0.63	x	0.7	=	7.11	(80)

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

(83)m=	323.82	548.09	747.19	931.99	1057.34	1057.68	1016.24	920.12	810.05	604.38	387.07	277.73	(83)

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

(84)m=	864.87	1086.87	1268.35	1424.35	1519.78	1491.78	1432.21	1342.69	1247.66	1071.03	887.14	803.52	(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	0.98	0.95	0.88	0.73	0.57	0.62	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=	19.44	19.66	19.97	20.36	20.69	20.91	20.98	20.96	20.82	20.37	19.82	19.4	(87)

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

(88)m=	19.75	19.76	19.76	19.77	19.77	19.78	19.78	19.78	19.78	19.77	19.77	19.76	(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	0.63	0.42	0.47	0.76	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=	17.7	18.02	18.47	19.03	19.48	19.72	19.77	19.77	19.63	19.06	18.27	17.65	(90)

fLA = Living area ÷ (4) = 0.11 (91)

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

(92)m=	17.9	18.21	18.64	19.18	19.61	19.86	19.91	19.91	19.77	19.2	18.45	17.85	(92)

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

(93)m=	17.9	18.21	18.64	19.18	19.61	19.86	19.91	19.91	19.77	19.2	18.45	17.85	(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:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.99	0.97	0.92	0.82	0.63	0.44	0.49	0.76	0.94	0.99	1		(94)

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

(95)m=	860.26	1072.12	1227.57	1311.54	1241.78	943.21	626.59	656.65	943.9	1009.34	876.82	800.34		(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=	2684.8	2621.43	2387.25	2000.26	1536.99	1011.41	637.03	673.52	1094.8	1670.95	2212.37	2672.22		(97)

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

(98)m=	1357.46	1041.14	862.8	495.88	219.64	0	0	0	0	492.24	961.6	1392.68		

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 6823.43 (98)

Space heating requirement in kWh/m²/year 48.79 (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)	1357.46	1041.14	862.8	495.88	219.64	0	0	0	0	492.24	961.6	1392.68		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1451.83	1113.51	922.78	530.35	234.91	0	0	0	0	526.46	1028.45	1489.5		(211)

Total (kWh/year) =$Sum(211)_{1...5,10....12}$= 7297.79 (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)

	223.7	197.22	207.25	185.95	182.34	163.1	156.81	171.84	171.47	192.81	203.67	218.38		

Efficiency of water heater 79.8 (216)

(217)m=	88.82	88.61	88.21	87.31	85.31	79.8	79.8	79.8	79.8	87.21	88.43	88.88		(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	251.87	222.58	234.95	212.98	213.74	204.39	196.5	215.34	214.87	221.09	230.32	245.68		

Total = $Sum(219a)_{1...12}$ = 2664.32 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		7297.79
Water heating fuel used		2664.32
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			486.9	(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	=	1576.32	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	575.49	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2151.82	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	252.7	(268)
Total CO2, kg/year		sum of (265)…(271) =		2443.44	(272)

TER = 25.93 (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 17:36:51

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 002

Address : GT 002, 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)	29.92 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.37 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	57.0 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	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
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: West	3.43m²
Windows facing: North	6.66m²
Windows facing: East	3.43m²
Windows facing: South	7.7m²
Windows facing: South	2.65m²
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
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: GT 002

Address : GT 002, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72	(1a) x	2.9	(2a) =	208.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	208.8	(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	
Doors			3.89	x	1.4	=	5.446			(26)
Windows Type 1			3.43	x1/[1/(1.4)+ 0.04]		=	4.55			(27)
Windows Type 2			3.33	x1/[1/(1.4)+ 0.04]		=	4.41			(27)
Windows Type 3			3.43	x1/[1/(1.4)+ 0.04]		=	4.55			(27)
Windows Type 4			7.7	x1/[1/(1.4)+ 0.04]		=	10.21			(27)
Windows Type 5			2.65	x1/[1/(1.4)+ 0.04]		=	3.51			(27)
Floor			72	x	0.12	=	8.639999			(28)
Walls	83.2	27.76	55.44	x	0.12	=	6.65			(29)
Roof	9.02	0	9.02	x	0.1	=	0.9			(30)
Total area of elements, m²			164.22							(31)
Party wall			23.9	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) = 53.29 (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 14.57 (36)

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

Total fabric heat loss (33) + (36) = 67.85 (37)

DER WorkSheet: New dwelling design stage

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=	15.56	15.42	15.27	14.54	14.39	13.66	13.66	13.51	13.95	14.39	14.69	14.98	(38)

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

(39)m=	83.42	83.27	83.12	82.39	82.25	81.51	81.51	81.37	81.81	82.25	82.54	82.83	

Average = $Sum(39)_{1...12}$ /12= 82.36 (39)

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

(40)m=	1.16	1.16	1.15	1.14	1.14	1.13	1.13	1.13	1.14	1.14	1.15	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 2.29 (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 88.68 (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=	97.54	94	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54	

Total = $Sum(44)_{1...12}$ = 1064.1 (44)

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

(45)m=	144.65	126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09	

Total = $Sum(45)_{1...12}$ = 1395.2 (45)

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

(46)m=	21.7	18.98	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01	(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)

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

(57)m=	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=	199.93	176.44	185.83	167.31	164.49	147.73	142.6	155.49	154.9	173.46	182.5	195.37	(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=	199.93	176.44	185.83	167.31	164.49	147.73	142.6	155.49	154.9	173.46	182.5	195.37

Output from water heater (annual)$_{1...12}$ | 2046.04 | (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=	92.32	82.01	87.63	80.64	80.53	74.13	73.26	77.54	76.51	83.52	85.69	90.8	(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=	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	(66)

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

(67)m=	18	15.99	13	9.84	7.36	6.21	6.71	8.73	11.71	14.87	17.36	18.5	(67)

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

(68)m=	201.92	204.01	198.73	187.49	173.3	159.97	151.06	148.96	154.24	165.48	179.67	193.01	(68)

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

(69)m=	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	(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=	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	(71)

Water heating gains (Table 5)

(72)m=	124.08	122.04	117.78	112	108.24	102.96	98.46	104.22	106.27	112.25	119.01	122.04	(72)

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

(73)m=	401.41	399.44	386.92	366.74	346.31	326.54	313.64	319.32	329.63	350.01	373.45	390.96	(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)

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North	0.9x	0.77	x	3.33	x	10.63	x	0.4	x	0.8	=	15.7	(74)
North	0.9x	0.77	x	3.33	x	20.32	x	0.4	x	0.8	=	30.01	(74)
North	0.9x	0.77	x	3.33	x	34.53	x	0.4	x	0.8	=	51	(74)
North	0.9x	0.77	x	3.33	x	55.46	x	0.4	x	0.8	=	81.92	(74)
North	0.9x	0.77	x	3.33	x	74.72	x	0.4	x	0.8	=	110.35	(74)
North	0.9x	0.77	x	3.33	x	79.99	x	0.4	x	0.8	=	118.13	(74)
North	0.9x	0.77	x	3.33	x	74.68	x	0.4	x	0.8	=	110.29	(74)
North	0.9x	0.77	x	3.33	x	59.25	x	0.4	x	0.8	=	87.5	(74)
North	0.9x	0.77	x	3.33	x	41.52	x	0.4	x	0.8	=	61.32	(74)
North	0.9x	0.77	x	3.33	x	24.19	x	0.4	x	0.8	=	35.73	(74)
North	0.9x	0.77	x	3.33	x	13.12	x	0.4	x	0.8	=	19.37	(74)
North	0.9x	0.77	x	3.33	x	8.86	x	0.4	x	0.8	=	13.09	(74)
East	0.9x	0.77	x	3.43	x	19.64	x	0.4	x	0.8	=	14.94	(76)
East	0.9x	0.77	x	3.43	x	38.42	x	0.4	x	0.8	=	29.22	(76)
East	0.9x	0.77	x	3.43	x	63.27	x	0.4	x	0.8	=	48.13	(76)
East	0.9x	0.77	x	3.43	x	92.28	x	0.4	x	0.8	=	70.19	(76)
East	0.9x	0.77	x	3.43	x	113.09	x	0.4	x	0.8	=	86.02	(76)
East	0.9x	0.77	x	3.43	x	115.77	x	0.4	x	0.8	=	88.06	(76)
East	0.9x	0.77	x	3.43	x	110.22	x	0.4	x	0.8	=	83.84	(76)
East	0.9x	0.77	x	3.43	x	94.68	x	0.4	x	0.8	=	72.01	(76)
East	0.9x	0.77	x	3.43	x	73.59	x	0.4	x	0.8	=	55.97	(76)
East	0.9x	0.77	x	3.43	x	45.59	x	0.4	x	0.8	=	34.68	(76)
East	0.9x	0.77	x	3.43	x	24.49	x	0.4	x	0.8	=	18.63	(76)
East	0.9x	0.77	x	3.43	x	16.15	x	0.4	x	0.8	=	12.29	(76)
South	0.9x	0.77	x	7.7	x	46.75	x	0.4	x	0.8	=	79.83	(78)
South	0.9x	0.77	x	2.65	x	46.75	x	0.4	x	0.8	=	27.47	(78)
South	0.9x	0.77	x	7.7	x	76.57	x	0.4	x	0.8	=	130.74	(78)
South	0.9x	0.77	x	2.65	x	76.57	x	0.4	x	0.8	=	45	(78)
South	0.9x	0.77	x	7.7	x	97.53	x	0.4	x	0.8	=	166.54	(78)
South	0.9x	0.77	x	2.65	x	97.53	x	0.4	x	0.8	=	57.32	(78)
South	0.9x	0.77	x	7.7	x	110.23	x	0.4	x	0.8	=	188.23	(78)
South	0.9x	0.77	x	2.65	x	110.23	x	0.4	x	0.8	=	64.78	(78)
South	0.9x	0.77	x	7.7	x	114.87	x	0.4	x	0.8	=	196.15	(78)
South	0.9x	0.77	x	2.65	x	114.87	x	0.4	x	0.8	=	67.51	(78)
South	0.9x	0.77	x	7.7	x	110.55	x	0.4	x	0.8	=	188.77	(78)
South	0.9x	0.77	x	2.65	x	110.55	x	0.4	x	0.8	=	64.96	(78)
South	0.9x	0.77	x	7.7	x	108.01	x	0.4	x	0.8	=	184.44	(78)
South	0.9x	0.77	x	2.65	x	108.01	x	0.4	x	0.8	=	63.47	(78)
South	0.9x	0.77	x	7.7	x	104.89	x	0.4	x	0.8	=	179.11	(78)
South	0.9x	0.77	x	2.65	x	104.89	x	0.4	x	0.8	=	61.64	(78)
South	0.9x	0.77	x	7.7	x	101.89	x	0.4	x	0.8	=	173.97	(78)

South	0.9x	0.77	x	2.65	x	101.89	x	0.4	x	0.8	=	59.87	(78)
South	0.9x	0.77	x	7.7	x	82.59	x	0.4	x	0.8	=	141.02	(78)
South	0.9x	0.77	x	2.65	x	82.59	x	0.4	x	0.8	=	48.53	(78)
South	0.9x	0.77	x	7.7	x	55.42	x	0.4	x	0.8	=	94.63	(78)
South	0.9x	0.77	x	2.65	x	55.42	x	0.4	x	0.8	=	32.57	(78)
South	0.9x	0.77	x	7.7	x	40.4	x	0.4	x	0.8	=	68.98	(78)
South	0.9x	0.77	x	2.65	x	40.4	x	0.4	x	0.8	=	23.74	(78)
West	0.9x	0.77	x	3.43	x	19.64	x	0.4	x	0.8	=	14.94	(80)
West	0.9x	0.77	x	3.43	x	38.42	x	0.4	x	0.8	=	29.22	(80)
West	0.9x	0.77	x	3.43	x	63.27	x	0.4	x	0.8	=	48.13	(80)
West	0.9x	0.77	x	3.43	x	92.28	x	0.4	x	0.8	=	70.19	(80)
West	0.9x	0.77	x	3.43	x	113.09	x	0.4	x	0.8	=	86.02	(80)
West	0.9x	0.77	x	3.43	x	115.77	x	0.4	x	0.8	=	88.06	(80)
West	0.9x	0.77	x	3.43	x	110.22	x	0.4	x	0.8	=	83.84	(80)
West	0.9x	0.77	x	3.43	x	94.68	x	0.4	x	0.8	=	72.01	(80)
West	0.9x	0.77	x	3.43	x	73.59	x	0.4	x	0.8	=	55.97	(80)
West	0.9x	0.77	x	3.43	x	45.59	x	0.4	x	0.8	=	34.68	(80)
West	0.9x	0.77	x	3.43	x	24.49	x	0.4	x	0.8	=	18.63	(80)
West	0.9x	0.77	x	3.43	x	16.15	x	0.4	x	0.8	=	12.29	(80)

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

(83)m=	152.89	264.2	371.12	475.31	546.05	547.98	525.87	472.29	407.12	294.63	183.82	130.38	(83)

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

(84)m=	554.3	663.64	758.04	842.05	892.36	874.53	839.52	791.6	736.74	644.64	557.27	521.35	(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	0.96	0.9	0.76	0.58	0.42	0.47	0.71	0.93	0.99	1	(86)

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

(87)m=	19.9	20.1	20.38	20.68	20.89	20.98	21	20.99	20.94	20.66	20.22	19.86	(87)

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

(88)m=	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.98	19.97	19.97	19.96	19.96	(88)

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

(89)m=	0.99	0.98	0.95	0.87	0.71	0.49	0.33	0.37	0.62	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=	18.51	18.8	19.19	19.62	19.87	19.96	19.97	19.97	19.93	19.6	18.98	18.46	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.04	19.29	19.64	20.02	20.25	20.34	20.36	20.36	20.31	20	19.45	18.99	(92)

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

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(93)m=	19.04	19.29	19.64	20.02	20.25	20.34	20.36	20.36	20.31	20	19.45	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	0.94	0.87	0.72	0.52	0.36	0.4	0.65	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	548.56	647.8	716.18	730.6	644.85	459.02	305.21	320.1	481.5	580.58	544.88	517.22	(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=	1229.17	1198.55	1092.29	916.01	703.55	468.29	306.37	322.06	508.26	773.25	1019.01	1224.67	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	506.38	370.1	279.83	133.5	43.67	0	0	0	0	143.35	341.37	526.34	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2344.55	(98)
Space heating requirement in kWh/m²/year	32.56	(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		2344.55	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2579	(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		2046.04	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2250.65	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	48.3	(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		168.76	(330a)

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warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	168.76	(331)
Energy for lighting (calculated in Appendix L)		317.91	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-609.72	(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	=	785.76	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	25.07	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	810.83	(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) =				810.83	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	87.59	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	164.99	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-316.44	(380)
Total CO2, kg/year	sum of (376)…(382) =				746.97	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.37	(384)
EI rating (section 14)					91.44	(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: GT 002

Address : GT 002, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72	(1a) x	2.9	(2a) =	208.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	208.8	(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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	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	
Doors			3.89	x	1.2	=	4.668			(26)
Windows Type 1			2.03	x1/[1/(1.4)+ 0.04]		=	2.69			(27)
Windows Type 2			1.97	x1/[1/(1.4)+ 0.04]		=	2.61			(27)
Windows Type 3			2.03	x1/[1/(1.4)+ 0.04]		=	2.69			(27)
Windows Type 4			4.55	x1/[1/(1.4)+ 0.04]		=	6.03			(27)
Windows Type 5			1.57	x1/[1/(1.4)+ 0.04]		=	2.08			(27)
Floor			72	x	0.13	=	9.36			(28)
Walls	83.2	18.01	65.19	x	0.18	=	11.73			(29)
Roof	9.02	0	9.02	x	0.13	=	1.17			(30)
Total area of elements, m²			164.22							(31)
Party wall			23.9	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) = 45.65 (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 10.93 (36)

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

Total fabric heat loss (33) + (36) = 56.58 (37)

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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=	40.72	40.48	40.24	39.12	38.91	37.93	37.93	37.75	38.31	38.91	39.33	39.78		(38)

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

(39)m=	97.3	97.06	96.82	95.7	95.49	94.51	94.51	94.33	94.89	95.49	95.92	96.36		
										Average = Sum(39)1...12 /12=			95.7	(39)

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

(40)m=	1.35	1.35	1.34	1.33	1.33	1.31	1.31	1.31	1.32	1.33	1.33	1.34		
										Average = Sum(40)1...12 /12=			1.33	(40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.29 (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 — 88.68 (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=	97.54	94	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54		
										Total = Sum(44)1...12 =			1064.1	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)														
(45)m=	144.65	126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09		
										Total = Sum(45)1...12 =			1395.2	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)														
(46)m=	21.7	18.98	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01		(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

(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)

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

(57)m=	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=	191.25	168.6	177.15	158.91	155.81	139.33	133.92	146.8	146.5	164.77	174.09	186.68	(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=	191.25	168.6	177.15	158.91	155.81	139.33	133.92	146.8	146.5	164.77	174.09	186.68

Output from water heater (annual)$_{1…12}$ | 1943.82 | (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=	85.37	75.73	80.68	73.92	73.59	67.41	66.31	70.6	69.79	76.57	78.97	83.86	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	(66)

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

(67)m=	18	15.99	13	9.84	7.36	6.21	6.71	8.73	11.71	14.87	17.36	18.5	(67)

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

(68)m=	201.92	204.01	198.73	187.49	173.3	159.97	151.06	148.96	154.24	165.48	179.67	193.01	(68)

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

(69)m=	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	(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=	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	(71)

Water heating gains (Table 5)

(72)m=	114.75	112.7	108.45	102.66	98.91	93.62	89.13	94.89	96.93	102.92	109.68	112.71	(72)

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

(73)m=	395.07	393.11	380.59	360.41	339.98	320.21	307.31	312.98	323.29	343.68	367.11	384.63	(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)

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North	0.9x	0.77	x	1.97	x	10.63	x	0.63	x	0.7	=	12.8	(74)
North	0.9x	0.77	x	1.97	x	20.32	x	0.63	x	0.7	=	24.47	(74)
North	0.9x	0.77	x	1.97	x	34.53	x	0.63	x	0.7	=	41.58	(74)
North	0.9x	0.77	x	1.97	x	55.46	x	0.63	x	0.7	=	66.79	(74)
North	0.9x	0.77	x	1.97	x	74.72	x	0.63	x	0.7	=	89.97	(74)
North	0.9x	0.77	x	1.97	x	79.99	x	0.63	x	0.7	=	96.31	(74)
North	0.9x	0.77	x	1.97	x	74.68	x	0.63	x	0.7	=	89.92	(74)
North	0.9x	0.77	x	1.97	x	59.25	x	0.63	x	0.7	=	71.34	(74)
North	0.9x	0.77	x	1.97	x	41.52	x	0.63	x	0.7	=	49.99	(74)
North	0.9x	0.77	x	1.97	x	24.19	x	0.63	x	0.7	=	29.13	(74)
North	0.9x	0.77	x	1.97	x	13.12	x	0.63	x	0.7	=	15.8	(74)
North	0.9x	0.77	x	1.97	x	8.86	x	0.63	x	0.7	=	10.67	(74)
East	0.9x	0.77	x	2.03	x	19.64	x	0.63	x	0.7	=	12.18	(76)
East	0.9x	0.77	x	2.03	x	38.42	x	0.63	x	0.7	=	23.84	(76)
East	0.9x	0.77	x	2.03	x	63.27	x	0.63	x	0.7	=	39.25	(76)
East	0.9x	0.77	x	2.03	x	92.28	x	0.63	x	0.7	=	57.25	(76)
East	0.9x	0.77	x	2.03	x	113.09	x	0.63	x	0.7	=	70.16	(76)
East	0.9x	0.77	x	2.03	x	115.77	x	0.63	x	0.7	=	71.82	(76)
East	0.9x	0.77	x	2.03	x	110.22	x	0.63	x	0.7	=	68.38	(76)
East	0.9x	0.77	x	2.03	x	94.68	x	0.63	x	0.7	=	58.74	(76)
East	0.9x	0.77	x	2.03	x	73.59	x	0.63	x	0.7	=	45.65	(76)
East	0.9x	0.77	x	2.03	x	45.59	x	0.63	x	0.7	=	28.28	(76)
East	0.9x	0.77	x	2.03	x	24.49	x	0.63	x	0.7	=	15.19	(76)
East	0.9x	0.77	x	2.03	x	16.15	x	0.63	x	0.7	=	10.02	(76)
South	0.9x	0.77	x	4.55	x	46.75	x	0.63	x	0.7	=	65.01	(78)
South	0.9x	0.77	x	1.57	x	46.75	x	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	x	4.55	x	76.57	x	0.63	x	0.7	=	106.47	(78)
South	0.9x	0.77	x	1.57	x	76.57	x	0.63	x	0.7	=	36.74	(78)
South	0.9x	0.77	x	4.55	x	97.53	x	0.63	x	0.7	=	135.62	(78)
South	0.9x	0.77	x	1.57	x	97.53	x	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	x	4.55	x	110.23	x	0.63	x	0.7	=	153.29	(78)
South	0.9x	0.77	x	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)
South	0.9x	0.77	x	4.55	x	114.87	x	0.63	x	0.7	=	159.73	(78)
South	0.9x	0.77	x	1.57	x	114.87	x	0.63	x	0.7	=	55.12	(78)
South	0.9x	0.77	x	4.55	x	110.55	x	0.63	x	0.7	=	153.72	(78)
South	0.9x	0.77	x	1.57	x	110.55	x	0.63	x	0.7	=	53.04	(78)
South	0.9x	0.77	x	4.55	x	108.01	x	0.63	x	0.7	=	150.19	(78)
South	0.9x	0.77	x	1.57	x	108.01	x	0.63	x	0.7	=	51.83	(78)
South	0.9x	0.77	x	4.55	x	104.89	x	0.63	x	0.7	=	145.86	(78)
South	0.9x	0.77	x	1.57	x	104.89	x	0.63	x	0.7	=	50.33	(78)
South	0.9x	0.77	x	4.55	x	101.89	x	0.63	x	0.7	=	141.68	(78)

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South	0.9x	0.77	x	1.57	x	101.89	x	0.63	x	0.7	=	48.89	(78)
South	0.9x	0.77	x	4.55	x	82.59	x	0.63	x	0.7	=	114.84	(78)
South	0.9x	0.77	x	1.57	x	82.59	x	0.63	x	0.7	=	39.63	(78)
South	0.9x	0.77	x	4.55	x	55.42	x	0.63	x	0.7	=	77.06	(78)
South	0.9x	0.77	x	1.57	x	55.42	x	0.63	x	0.7	=	26.59	(78)
South	0.9x	0.77	x	4.55	x	40.4	x	0.63	x	0.7	=	56.18	(78)
South	0.9x	0.77	x	1.57	x	40.4	x	0.63	x	0.7	=	19.38	(78)
West	0.9x	0.77	x	2.03	x	19.64	x	0.63	x	0.7	=	12.18	(80)
West	0.9x	0.77	x	2.03	x	38.42	x	0.63	x	0.7	=	23.84	(80)
West	0.9x	0.77	x	2.03	x	63.27	x	0.63	x	0.7	=	39.25	(80)
West	0.9x	0.77	x	2.03	x	92.28	x	0.63	x	0.7	=	57.25	(80)
West	0.9x	0.77	x	2.03	x	113.09	x	0.63	x	0.7	=	70.16	(80)
West	0.9x	0.77	x	2.03	x	115.77	x	0.63	x	0.7	=	71.82	(80)
West	0.9x	0.77	x	2.03	x	110.22	x	0.63	x	0.7	=	68.38	(80)
West	0.9x	0.77	x	2.03	x	94.68	x	0.63	x	0.7	=	58.74	(80)
West	0.9x	0.77	x	2.03	x	73.59	x	0.63	x	0.7	=	45.65	(80)
West	0.9x	0.77	x	2.03	x	45.59	x	0.63	x	0.7	=	28.28	(80)
West	0.9x	0.77	x	2.03	x	24.49	x	0.63	x	0.7	=	15.19	(80)
West	0.9x	0.77	x	2.03	x	16.15	x	0.63	x	0.7	=	10.02	(80)

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

(83)m=	124.62	215.35	302.51	387.46	445.14	446.72	428.7	385	331.86	240.16	149.83	106.27	(83)

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

(84)m=	519.69	608.46	683.1	747.87	785.12	766.93	736	697.98	655.15	583.84	516.94	490.9	(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	0.86	0.71	0.55	0.59	0.82	0.96	0.99	1	(86)

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

(87)m=	19.61	19.79	20.07	20.43	20.74	20.92	20.98	20.97	20.85	20.45	19.96	19.58	(87)

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

(88)m=	19.8	19.8	19.81	19.82	19.82	19.83	19.83	19.83	19.83	19.82	19.82	19.81	(88)

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

(89)m=	0.99	0.99	0.97	0.92	0.81	0.61	0.41	0.46	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=	17.97	18.24	18.65	19.16	19.57	19.78	19.82	19.82	19.71	19.21	18.5	17.93	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	18.59	18.83	19.19	19.64	20.01	20.21	20.26	20.26	20.14	19.68	19.05	18.55	(92)

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

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(93)m=	18.59	18.83	19.19	19.64	20.01	20.21	20.26	20.26	20.14	19.68	19.05	18.55	(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	0.82	0.65	0.46	0.51	0.76	0.94	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	515.49	598.62	659.78	688.53	645.38	494.97	339.84	354.43	497.93	547.34	508.8	487.76	(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=	1390.28	1351.71	1228.44	1027.88	793.17	530.41	345.95	363.76	573.17	866.68	1146.54	1382.99	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	650.85	506.08	423.08	244.33	109.95	0	0	0	0	237.59	459.17	666.05	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3297.1 (98)

Space heating requirement in kWh/m²/year 45.79 (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)														
	650.85	506.08	423.08	244.33	109.95	0	0	0	0	237.59	459.17	666.05		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	696.09	541.26	452.49	261.32	117.6	0	0	0	0	254.11	491.09	712.35		
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													3526.31	(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)														
	191.25	168.6	177.15	158.91	155.81	139.33	133.92	146.8	146.5	164.77	174.09	186.68		
Efficiency of water heater													79.8	(216)
(217)m=	87.83	87.57	87.05	85.96	83.9	79.8	79.8	79.8	79.8	85.79	87.28	87.92		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	217.76	192.54	203.49	184.87	185.69	174.6	167.82	183.97	183.58	192.07	199.46	212.34		
Total = Sum(219a)$_{1...12}$ =													2298.19	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		3526.31

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Water heating fuel used			2298.19	
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			317.91	(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	=	761.68	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	496.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1258.09	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	164.99	(268)
Total CO2, kg/year		sum of (265)…(271) =		1462.01	(272)

TER = 29.92 (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 17:36:43

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 71.8m²

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

Address : GT 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)	32.14 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.71 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	68.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	70.3 kWh/m²	
		Fail

Excess energy = 1.38 kg/m² (02.0 %)

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	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: West	6.86m²	
Windows facing: North	13.32m²	
Windows facing: East	6.86m²	
Windows facing: North	2.65m²	
Windows facing: East	2.65m²	
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
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: GT 004

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

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	71.8	(1a) x	2.9	(2a) =	208.22	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	71.8	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	208.22	(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		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	
Doors			3.89	x	1.4	=	5.446			(26)
Windows Type 1			3.43	x1/[1/(1.4)+ 0.04]		=	4.55			(27)
Windows Type 2			3.33	x1/[1/(1.4)+ 0.04]		=	4.41			(27)
Windows Type 3			3.43	x1/[1/(1.4)+ 0.04]		=	4.55			(27)
Windows Type 4			2.65	x1/[1/(1.4)+ 0.04]		=	3.51			(27)
Windows Type 5			2.65	x1/[1/(1.4)+ 0.04]		=	3.51			(27)
Floor			71.8	x	0.12	=	8.616			(28)
Walls	81.72	36.23	45.49	x	0.12	=	5.46			(29)
Roof	18.04	0	18.04	x	0.1	=	1.8			(30)
Total area of elements, m²			171.56							(31)
Party wall			54.23	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) = 64.2 (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 18.54 (36)

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

Total fabric heat loss (33) + (36) = 82.74 (37)

DER WorkSheet: New dwelling design stage

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=	15.52	15.37	15.23	14.5	14.35	13.62	13.62	13.48	13.91	14.35	14.64	14.94	(38)

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

(39)m=	98.26	98.11	97.96	97.23	97.09	96.36	96.36	96.21	96.65	97.09	97.38	97.67	

Average = Sum(39)$_{1...12}$ /12= 97.2 (39)

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

(40)m=	1.37	1.37	1.36	1.35	1.35	1.34	1.34	1.34	1.35	1.35	1.36	1.36	

Average = Sum(40)$_{1...12}$ /12= 1.35 (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 2.29 (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 88.56 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more 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=	97.42	93.88	90.34	86.79	83.25	79.71	79.71	83.25	86.79	90.34	93.88	97.42	

Total = Sum(44)$_{1...12}$ = 1062.77 (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=	144.47	126.36	130.39	113.68	109.07	94.12	87.22	100.08	101.28	118.03	128.84	139.91	

Total = Sum(45)$_{1...12}$ = 1393.46 (45)

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

(46)m=	21.67	18.95	19.56	17.05	16.36	14.12	13.08	15.01	15.19	17.7	19.33	20.99	(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=	199.75	176.28	185.66	167.17	164.35	147.62	142.5	155.36	154.77	173.31	182.34	195.19	(62)

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

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

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

Output from water heater

(64)m=	199.75	176.28	185.66	167.17	164.35	147.62	142.5	155.36	154.77	173.31	182.34	195.19

Output from water heater (annual)$_{1...12}$ — 2044.3 (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=	92.26	81.96	87.58	80.59	80.49	74.09	73.22	77.5	76.47	83.47	85.63	90.74	(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=	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	(66)

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

(67)m=	17.96	15.95	12.97	9.82	7.34	6.2	6.7	8.71	11.68	14.84	17.32	18.46	(67)

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

(68)m=	201.46	203.55	198.28	187.07	172.91	159.61	150.72	148.63	153.89	165.11	179.27	192.57	(68)

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

(69)m=	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	(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=	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	(71)

Water heating gains (Table 5)

(72)m=	124	121.96	117.71	111.93	108.18	102.9	98.42	104.17	106.21	112.19	118.94	121.97	(72)

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

(73)m=	400.76	398.8	386.3	366.16	345.77	326.04	313.17	318.83	329.12	349.47	372.85	390.33	(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)

DER WorkSheet: New dwelling design stage

North	0.9x	0.77	x	3.33	x	10.63	x	0.4	x	0.8	=	31.41	(74)
North	0.9x	0.77	x	2.65	x	10.63	x	0.4	x	0.8	=	6.25	(74)
North	0.9x	0.77	x	3.33	x	20.32	x	0.4	x	0.8	=	60.02	(74)
North	0.9x	0.77	x	2.65	x	20.32	x	0.4	x	0.8	=	11.94	(74)
North	0.9x	0.77	x	3.33	x	34.53	x	0.4	x	0.8	=	102	(74)
North	0.9x	0.77	x	2.65	x	34.53	x	0.4	x	0.8	=	20.29	(74)
North	0.9x	0.77	x	3.33	x	55.46	x	0.4	x	0.8	=	163.83	(74)
North	0.9x	0.77	x	2.65	x	55.46	x	0.4	x	0.8	=	32.59	(74)
North	0.9x	0.77	x	3.33	x	74.72	x	0.4	x	0.8	=	220.7	(74)
North	0.9x	0.77	x	2.65	x	74.72	x	0.4	x	0.8	=	43.91	(74)
North	0.9x	0.77	x	3.33	x	79.99	x	0.4	x	0.8	=	236.26	(74)
North	0.9x	0.77	x	2.65	x	79.99	x	0.4	x	0.8	=	47	(74)
North	0.9x	0.77	x	3.33	x	74.68	x	0.4	x	0.8	=	220.58	(74)
North	0.9x	0.77	x	2.65	x	74.68	x	0.4	x	0.8	=	43.88	(74)
North	0.9x	0.77	x	3.33	x	59.25	x	0.4	x	0.8	=	175	(74)
North	0.9x	0.77	x	2.65	x	59.25	x	0.4	x	0.8	=	34.82	(74)
North	0.9x	0.77	x	3.33	x	41.52	x	0.4	x	0.8	=	122.63	(74)
North	0.9x	0.77	x	2.65	x	41.52	x	0.4	x	0.8	=	24.4	(74)
North	0.9x	0.77	x	3.33	x	24.19	x	0.4	x	0.8	=	71.45	(74)
North	0.9x	0.77	x	2.65	x	24.19	x	0.4	x	0.8	=	14.22	(74)
North	0.9x	0.77	x	3.33	x	13.12	x	0.4	x	0.8	=	38.75	(74)
North	0.9x	0.77	x	2.65	x	13.12	x	0.4	x	0.8	=	7.71	(74)
North	0.9x	0.77	x	3.33	x	8.86	x	0.4	x	0.8	=	26.18	(74)
North	0.9x	0.77	x	2.65	x	8.86	x	0.4	x	0.8	=	5.21	(74)
East	0.9x	0.77	x	3.43	x	19.64	x	0.4	x	0.8	=	29.88	(76)
East	0.9x	0.77	x	2.65	x	19.64	x	0.4	x	0.8	=	11.54	(76)
East	0.9x	0.77	x	3.43	x	38.42	x	0.4	x	0.8	=	58.45	(76)
East	0.9x	0.77	x	2.65	x	38.42	x	0.4	x	0.8	=	22.58	(76)
East	0.9x	0.77	x	3.43	x	63.27	x	0.4	x	0.8	=	96.26	(76)
East	0.9x	0.77	x	2.65	x	63.27	x	0.4	x	0.8	=	37.18	(76)
East	0.9x	0.77	x	3.43	x	92.28	x	0.4	x	0.8	=	140.38	(76)
East	0.9x	0.77	x	2.65	x	92.28	x	0.4	x	0.8	=	54.23	(76)
East	0.9x	0.77	x	3.43	x	113.09	x	0.4	x	0.8	=	172.04	(76)
East	0.9x	0.77	x	2.65	x	113.09	x	0.4	x	0.8	=	66.46	(76)
East	0.9x	0.77	x	3.43	x	115.77	x	0.4	x	0.8	=	176.12	(76)
East	0.9x	0.77	x	2.65	x	115.77	x	0.4	x	0.8	=	68.03	(76)
East	0.9x	0.77	x	3.43	x	110.22	x	0.4	x	0.8	=	167.67	(76)
East	0.9x	0.77	x	2.65	x	110.22	x	0.4	x	0.8	=	64.77	(76)
East	0.9x	0.77	x	3.43	x	94.68	x	0.4	x	0.8	=	144.03	(76)
East	0.9x	0.77	x	2.65	x	94.68	x	0.4	x	0.8	=	55.64	(76)
East	0.9x	0.77	x	3.43	x	73.59	x	0.4	x	0.8	=	111.95	(76)

East	0.9x	0.77	x	2.65	x	73.59	x	0.4	x	0.8	=	43.25	(76)
East	0.9x	0.77	x	3.43	x	45.59	x	0.4	x	0.8	=	69.35	(76)
East	0.9x	0.77	x	2.65	x	45.59	x	0.4	x	0.8	=	26.79	(76)
East	0.9x	0.77	x	3.43	x	24.49	x	0.4	x	0.8	=	37.25	(76)
East	0.9x	0.77	x	2.65	x	24.49	x	0.4	x	0.8	=	14.39	(76)
East	0.9x	0.77	x	3.43	x	16.15	x	0.4	x	0.8	=	24.57	(76)
East	0.9x	0.77	x	2.65	x	16.15	x	0.4	x	0.8	=	9.49	(76)
West	0.9x	0.77	x	3.43	x	19.64	x	0.4	x	0.8	=	29.88	(80)
West	0.9x	0.77	x	3.43	x	38.42	x	0.4	x	0.8	=	58.45	(80)
West	0.9x	0.77	x	3.43	x	63.27	x	0.4	x	0.8	=	96.26	(80)
West	0.9x	0.77	x	3.43	x	92.28	x	0.4	x	0.8	=	140.38	(80)
West	0.9x	0.77	x	3.43	x	113.09	x	0.4	x	0.8	=	172.04	(80)
West	0.9x	0.77	x	3.43	x	115.77	x	0.4	x	0.8	=	176.12	(80)
West	0.9x	0.77	x	3.43	x	110.22	x	0.4	x	0.8	=	167.67	(80)
West	0.9x	0.77	x	3.43	x	94.68	x	0.4	x	0.8	=	144.03	(80)
West	0.9x	0.77	x	3.43	x	73.59	x	0.4	x	0.8	=	111.95	(80)
West	0.9x	0.77	x	3.43	x	45.59	x	0.4	x	0.8	=	69.35	(80)
West	0.9x	0.77	x	3.43	x	24.49	x	0.4	x	0.8	=	37.25	(80)
West	0.9x	0.77	x	3.43	x	16.15	x	0.4	x	0.8	=	24.57	(80)

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

(83)m=	108.96	211.44	351.98	531.42	675.16	703.54	664.58	553.51	414.18	251.17	135.36	90.03	(83)

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

(84)m=	509.72	610.24	738.29	897.58	1020.93	1029.58	977.75	872.35	743.3	600.63	508.21	480.36	(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	0.57	0.43	0.49	0.77	0.96	0.99	1	(86)

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

(87)m=	19.57	19.77	20.12	20.54	20.84	20.97	20.99	20.99	20.88	20.45	19.93	19.54	(87)

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

(88)m=	19.79	19.79	19.79	19.8	19.8	19.81	19.81	19.81	19.8	19.8	19.8	19.79	(88)

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

(89)m=	0.99	0.99	0.96	0.88	0.7	0.48	0.31	0.37	0.68	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=	17.92	18.21	18.7	19.29	19.66	19.79	19.81	19.8	19.72	19.19	18.44	17.87	(90)

fLA = Living area ÷ (4) = 0.39 (91)

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

(92)m=	18.56	18.81	19.25	19.78	20.12	20.24	20.27	20.26	20.17	19.68	19.02	18.51	(92)

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

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(93)m=	18.56	18.81	19.25	19.78	20.12	20.24	20.27	20.26	20.17	19.68	19.02	18.51	(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	0.96	0.88	0.72	0.51	0.36	0.42	0.71	0.93	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	505.84	600.25	706.43	785.9	730.39	528.4	350.74	366.78	526.81	560.54	500.66	477.49	(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)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1401.05	1365.05	1248.86	1057.65	817.36	543.87	353.18	371.59	586.45	881.3	1160.51	1397.96	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	666.04	513.94	403.56	195.67	64.7	0	0	0	0	238.64	475.1	684.82	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	3242.48	(98)
Space heating requirement in kWh/m²/year	45.16	(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		3242.48	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	3566.73	(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		2044.3	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2248.73	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	58.15	(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		168.29	(330a)

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warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	168.29	(331)
Energy for lighting (calculated in Appendix L)		317.19	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-607.99	(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	=	946.15	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	30.18	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	976.33	(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) =				976.33	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	87.34	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	164.62	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-315.55	(380)
Total CO2, kg/year	sum of (376)…(382) =				912.75	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.71	(384)
EI rating (section 14)					89.53	(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: GT 004

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

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	71.8	(1a) x	2.9	(2a) =	208.22	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	71.8	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		208.22	(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) =	0.14	(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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	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	
Doors			3.89	x	1.2	=	4.668			(26)
Windows Type 1			1.49	x1/[1/(1.4)+ 0.04]		=	1.98			(27)
Windows Type 2			1.45	x1/[1/(1.4)+ 0.04]		=	1.92			(27)
Windows Type 3			1.49	x1/[1/(1.4)+ 0.04]		=	1.98			(27)
Windows Type 4			1.15	x1/[1/(1.4)+ 0.04]		=	1.52			(27)
Windows Type 5			1.15	x1/[1/(1.4)+ 0.04]		=	1.52			(27)
Floor			71.8	x	0.13	=	9.334			(28)
Walls	81.72	17.95	63.77	x	0.18	=	11.48			(29)
Roof	18.04	0	18.04	x	0.13	=	2.35			(30)
Total area of elements, m²			171.56							(31)
Party wall			54.23	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) = 46.47 (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 12.72 (36)

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

Total fabric heat loss (33) + (36) = 59.19 (37)

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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=	40.62	40.38	40.14	39.02	38.81	37.84	37.84	37.65	38.21	38.81	39.24	39.68		(38)

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

(39)m=	99.81	99.57	99.33	98.21	98	97.02	97.02	96.84	97.4	98	98.42	98.86		
										Average = Sum(39)$_{1...12}$ /12=			98.21	(39)

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

(40)m=	1.39	1.39	1.38	1.37	1.36	1.35	1.35	1.35	1.36	1.36	1.37	1.38		
										Average = Sum(40)$_{1...12}$ /12=			1.37	(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 — 2.29 (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 — 88.56 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more 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=	97.42	93.88	90.34	86.79	83.25	79.71	79.71	83.25	86.79	90.34	93.88	97.42		
										Total = Sum(44)$_{1...12}$ =			1062.77	(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=	144.47	126.36	130.39	113.68	109.07	94.12	87.22	100.08	101.28	118.03	128.84	139.91		
										Total = Sum(45)$_{1...12}$ =			1393.46	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)														
(46)m=	21.67	18.95	19.56	17.05	16.36	14.12	13.08	15.01	15.19	17.7	19.33	20.99		(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)

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

(57)m=	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=	191.07	168.44	176.98	158.77	155.67	139.21	133.81	146.68	146.37	164.63	173.93	186.51	(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=	191.07	168.44	176.98	158.77	155.67	139.21	133.81	146.68	146.37	164.63	173.93	186.51

Output from water heater (annual)$_{1...12}$ — 1942.08 (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=	85.31	75.68	80.63	73.87	73.54	67.37	66.28	70.55	69.75	76.52	78.91	83.8	(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=	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	(66)

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

(67)m=	17.96	15.95	12.97	9.82	7.34	6.2	6.7	8.71	11.68	14.84	17.32	18.46	(67)

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

(68)m=	201.46	203.55	198.28	187.07	172.91	159.61	150.72	148.63	153.89	165.11	179.27	192.57	(68)

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

(69)m=	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	(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=	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	(71)

Water heating gains (Table 5)

(72)m=	114.67	112.62	108.37	102.6	98.85	93.57	89.08	94.83	96.87	102.85	109.6	112.63	(72)

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

(73)m=	394.42	392.46	379.97	359.82	339.44	319.71	306.83	312.5	322.79	343.13	366.52	384	(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)

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North	0.9x	0.77	x	1.45	x	10.63	x	0.63	x	0.7	=	18.85	(74)
North	0.9x	0.77	x	1.15	x	10.63	x	0.63	x	0.7	=	3.74	(74)
North	0.9x	0.77	x	1.45	x	20.32	x	0.63	x	0.7	=	36.02	(74)
North	0.9x	0.77	x	1.15	x	20.32	x	0.63	x	0.7	=	7.14	(74)
North	0.9x	0.77	x	1.45	x	34.53	x	0.63	x	0.7	=	61.21	(74)
North	0.9x	0.77	x	1.15	x	34.53	x	0.63	x	0.7	=	12.14	(74)
North	0.9x	0.77	x	1.45	x	55.46	x	0.63	x	0.7	=	98.31	(74)
North	0.9x	0.77	x	1.15	x	55.46	x	0.63	x	0.7	=	19.49	(74)
North	0.9x	0.77	x	1.45	x	74.72	x	0.63	x	0.7	=	132.44	(74)
North	0.9x	0.77	x	1.15	x	74.72	x	0.63	x	0.7	=	26.26	(74)
North	0.9x	0.77	x	1.45	x	79.99	x	0.63	x	0.7	=	141.78	(74)
North	0.9x	0.77	x	1.15	x	79.99	x	0.63	x	0.7	=	28.11	(74)
North	0.9x	0.77	x	1.45	x	74.68	x	0.63	x	0.7	=	132.37	(74)
North	0.9x	0.77	x	1.15	x	74.68	x	0.63	x	0.7	=	26.25	(74)
North	0.9x	0.77	x	1.45	x	59.25	x	0.63	x	0.7	=	105.02	(74)
North	0.9x	0.77	x	1.15	x	59.25	x	0.63	x	0.7	=	20.82	(74)
North	0.9x	0.77	x	1.45	x	41.52	x	0.63	x	0.7	=	73.59	(74)
North	0.9x	0.77	x	1.15	x	41.52	x	0.63	x	0.7	=	14.59	(74)
North	0.9x	0.77	x	1.45	x	24.19	x	0.63	x	0.7	=	42.88	(74)
North	0.9x	0.77	x	1.15	x	24.19	x	0.63	x	0.7	=	8.5	(74)
North	0.9x	0.77	x	1.45	x	13.12	x	0.63	x	0.7	=	23.25	(74)
North	0.9x	0.77	x	1.15	x	13.12	x	0.63	x	0.7	=	4.61	(74)
North	0.9x	0.77	x	1.45	x	8.86	x	0.63	x	0.7	=	15.71	(74)
North	0.9x	0.77	x	1.15	x	8.86	x	0.63	x	0.7	=	3.12	(74)
East	0.9x	0.77	x	1.49	x	19.64	x	0.63	x	0.7	=	17.89	(76)
East	0.9x	0.77	x	1.15	x	19.64	x	0.63	x	0.7	=	6.9	(76)
East	0.9x	0.77	x	1.49	x	38.42	x	0.63	x	0.7	=	34.99	(76)
East	0.9x	0.77	x	1.15	x	38.42	x	0.63	x	0.7	=	13.5	(76)
East	0.9x	0.77	x	1.49	x	63.27	x	0.63	x	0.7	=	57.62	(76)
East	0.9x	0.77	x	1.15	x	63.27	x	0.63	x	0.7	=	22.24	(76)
East	0.9x	0.77	x	1.49	x	92.28	x	0.63	x	0.7	=	84.04	(76)
East	0.9x	0.77	x	1.15	x	92.28	x	0.63	x	0.7	=	32.43	(76)
East	0.9x	0.77	x	1.49	x	113.09	x	0.63	x	0.7	=	103	(76)
East	0.9x	0.77	x	1.15	x	113.09	x	0.63	x	0.7	=	39.75	(76)
East	0.9x	0.77	x	1.49	x	115.77	x	0.63	x	0.7	=	105.44	(76)
East	0.9x	0.77	x	1.15	x	115.77	x	0.63	x	0.7	=	40.69	(76)
East	0.9x	0.77	x	1.49	x	110.22	x	0.63	x	0.7	=	100.38	(76)
East	0.9x	0.77	x	1.15	x	110.22	x	0.63	x	0.7	=	38.74	(76)
East	0.9x	0.77	x	1.49	x	94.68	x	0.63	x	0.7	=	86.22	(76)
East	0.9x	0.77	x	1.15	x	94.68	x	0.63	x	0.7	=	33.27	(76)
East	0.9x	0.77	x	1.49	x	73.59	x	0.63	x	0.7	=	67.02	(76)

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East	0.9x	0.77	x	1.15	x	73.59	x	0.63	x	0.7	=	25.86	(76)
East	0.9x	0.77	x	1.49	x	45.59	x	0.63	x	0.7	=	41.52	(76)
East	0.9x	0.77	x	1.15	x	45.59	x	0.63	x	0.7	=	16.02	(76)
East	0.9x	0.77	x	1.49	x	24.49	x	0.63	x	0.7	=	22.3	(76)
East	0.9x	0.77	x	1.15	x	24.49	x	0.63	x	0.7	=	8.61	(76)
East	0.9x	0.77	x	1.49	x	16.15	x	0.63	x	0.7	=	14.71	(76)
East	0.9x	0.77	x	1.15	x	16.15	x	0.63	x	0.7	=	5.68	(76)
West	0.9x	0.77	x	1.49	x	19.64	x	0.63	x	0.7	=	17.89	(80)
West	0.9x	0.77	x	1.49	x	38.42	x	0.63	x	0.7	=	34.99	(80)
West	0.9x	0.77	x	1.49	x	63.27	x	0.63	x	0.7	=	57.62	(80)
West	0.9x	0.77	x	1.49	x	92.28	x	0.63	x	0.7	=	84.04	(80)
West	0.9x	0.77	x	1.49	x	113.09	x	0.63	x	0.7	=	103	(80)
West	0.9x	0.77	x	1.49	x	115.77	x	0.63	x	0.7	=	105.44	(80)
West	0.9x	0.77	x	1.49	x	110.22	x	0.63	x	0.7	=	100.38	(80)
West	0.9x	0.77	x	1.49	x	94.68	x	0.63	x	0.7	=	86.22	(80)
West	0.9x	0.77	x	1.49	x	73.59	x	0.63	x	0.7	=	67.02	(80)
West	0.9x	0.77	x	1.49	x	45.59	x	0.63	x	0.7	=	41.52	(80)
West	0.9x	0.77	x	1.49	x	24.49	x	0.63	x	0.7	=	22.3	(80)
West	0.9x	0.77	x	1.49	x	16.15	x	0.63	x	0.7	=	14.71	(80)

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

(83)m=	65.26	126.65	210.83	318.32	404.44	421.45	398.11	331.56	248.08	150.44	81.07	53.92	(83)

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

(84)m=	459.69	519.11	590.8	678.15	743.87	741.16	704.94	644.06	570.87	493.57	447.59	437.92	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.99	0.96	0.89	0.74	0.58	0.64	0.88	0.98	0.99	1	(86)

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

(87)m=	19.49	19.64	19.93	20.33	20.68	20.91	20.98	20.96	20.78	20.32	19.84	19.46	(87)

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

(88)m=	19.77	19.77	19.78	19.79	19.79	19.8	19.8	19.8	19.8	19.79	19.79	19.78	(88)

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

(89)m=	1	0.99	0.98	0.95	0.84	0.64	0.43	0.5	0.8	0.97	0.99	1	(89)

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

(90)m=	17.78	18	18.42	19	19.48	19.74	19.79	19.79	19.62	19.01	18.3	17.75	(90)

fLA = Living area ÷ (4) = 0.39 (91)

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

(92)m=	18.44	18.63	19	19.51	19.95	20.19	20.25	20.24	20.07	19.52	18.9	18.41	(92)

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

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(93)m=	18.44	18.63	19	19.51	19.95	20.19	20.25	20.24	20.07	19.52	18.9	18.41	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.98	0.94	0.85	0.67	0.49	0.56	0.82	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	457.27	514.26	578.3	638.21	629.76	497.67	345.58	357.49	469.63	475.27	443.33	436.05	(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=	1411.17	1367.47	1241.86	1042.25	808.07	542.42	354.16	372.02	581.43	874.01	1161.27	1405.19	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	709.7	573.35	493.69	290.91	132.66	0	0	0	0	296.66	516.92	721.04	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3734.93 (98)

Space heating requirement in kWh/m²/year 52.02 (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)													
	709.7	573.35	493.69	290.91	132.66	0	0	0	0	296.66	516.92	721.04	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	759.04	613.21	528.01	311.13	141.88	0	0	0	0	317.29	552.85	771.16	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 3994.58 (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)

	191.07	168.44	176.98	158.77	155.67	139.21	133.81	146.68	146.37	164.63	173.93	186.51	
Efficiency of water heater												79.8	(216)
(217)m=	88	87.83	87.41	86.41	84.39	79.8	79.8	79.8	79.8	86.37	87.54	88.07	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	217.13	191.79	202.48	183.74	184.46	174.45	167.69	183.81	183.42	190.61	198.68	211.77

Total = Sum(219a)$_{1...12}$ = 2290.03 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		3994.58

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Water heating fuel used			2290.03	
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			317.19	(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	=	862.83	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	494.65	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1357.48	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	164.62	(268)
Total CO2, kg/year		sum of (265)…(271) =		1561.02	(272)

TER = 32.14 (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 17:35:31

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 68.2m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 101

Address : GT 101, 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)	26.25 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	8.44 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.4 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	0.10 (max. 0.25)	0.10 (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: West	6.18m²	
Windows facing: West	6.18m²	
Windows facing: North	2.78m²	
Windows facing: North	4.47m²	
Windows facing: North	2.15m²	
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	0.1 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: GT 101

Address : GT 101, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	68.2	(1a)	x	2.6	(2a)	=	177.32	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	68.2	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	177.32	(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			6.18	x1/[1/(1.4)+ 0.04]		=	8.19			(27)
Windows Type 3			2.78	x1/[1/(1.4)+ 0.04]		=	3.69			(27)
Windows Type 4			4.47	x1/[1/(1.4)+ 0.04]		=	5.93			(27)
Windows Type 5			2.15	x1/[1/(1.4)+ 0.04]		=	2.85			(27)
Floor			68.2	x	0.1	=	6.82			(28)
Walls	48.39	21.76	26.63	x	0.12	=	3.2			(29)
Total area of elements, m²			116.59							(31)
Party wall			39.03	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) = 38.86 (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 8.16 (36)

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

Total fabric heat loss (33) + (36) = 47.03 (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=	13.22	13.09	12.97	12.35	12.22	11.6	11.6	11.48	11.85	12.22	12.47	12.72	(38)

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

(39)m=	60.24	60.12	59.99	59.37	59.25	58.63	58.63	58.5	58.87	59.25	59.5	59.74	

Average = Sum(39)$_{1…12}$ /12= 59.34 (39)

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

(40)m=	0.88	0.88	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.87	0.88

Average = Sum(40)$_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.2 (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 86.49 (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=	95.14	91.68	88.22	84.76	81.3	77.84	77.84	81.3	84.76	88.22	91.68	95.14	
											Total = Sum(44)$_{1...12}$ =	1037.87	(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=	141.09	123.4	127.33	111.01	106.52	91.92	85.18	97.74	98.91	115.27	125.82	136.64	
											Total = Sum(45)$_{1...12}$ =	1360.81	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	21.16	18.51	19.1	16.65	15.98	13.79	12.78	14.66	14.84	17.29	18.87	20.5	(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=	196.36	173.32	182.61	164.51	161.8	145.41	140.45	153.02	152.4	170.54	179.32	191.91	(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=	196.36	173.32	182.61	164.51	161.8	145.41	140.45	153.02	152.4	170.54	179.32	191.91	

Output from water heater (annual)$_{1...12}$ 2011.65 (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=	91.13	80.97	86.56	79.71	79.64	73.36	72.54	76.72	75.68	82.55	84.63	89.65	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	17.21	15.29	12.43	9.41	7.04	5.94	6.42	8.34	11.2	14.22	16.59	17.69	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	193.06	195.06	190.01	179.27	165.7	152.95	144.43	142.43	147.48	158.22	171.79	184.54	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	(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=	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	(71)
Water heating gains (Table 5)													
(72)m=	122.49	120.49	116.34	110.7	107.04	101.89	97.5	103.12	105.11	110.95	117.54	120.5	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	388.79	386.87	374.82	355.41	335.8	316.8	304.38	309.91	319.81	339.42	361.95	378.76	(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	2.78	x	10.63	x	0.4	x	0.8	=	6.56	(74)
North	0.9x	0.77	x	4.47	x	10.63	x	0.4	x	0.8	=	10.54	(74)
North	0.9x	0.77	x	2.15	x	10.63	x	0.4	x	0.8	=	5.07	(74)
North	0.9x	0.77	x	2.78	x	20.32	x	0.4	x	0.8	=	12.53	(74)
North	0.9x	0.77	x	4.47	x	20.32	x	0.4	x	0.8	=	20.14	(74)

North	0.9x	0.77	x	2.15	x	20.32	x	0.4	x	0.8	=	9.69	(74)
North	0.9x	0.77	x	2.78	x	34.53	x	0.4	x	0.8	=	21.29	(74)
North	0.9x	0.77	x	4.47	x	34.53	x	0.4	x	0.8	=	34.23	(74)
North	0.9x	0.77	x	2.15	x	34.53	x	0.4	x	0.8	=	16.46	(74)
North	0.9x	0.77	x	2.78	x	55.46	x	0.4	x	0.8	=	34.19	(74)
North	0.9x	0.77	x	4.47	x	55.46	x	0.4	x	0.8	=	54.98	(74)
North	0.9x	0.77	x	2.15	x	55.46	x	0.4	x	0.8	=	26.44	(74)
North	0.9x	0.77	x	2.78	x	74.72	x	0.4	x	0.8	=	46.06	(74)
North	0.9x	0.77	x	4.47	x	74.72	x	0.4	x	0.8	=	74.06	(74)
North	0.9x	0.77	x	2.15	x	74.72	x	0.4	x	0.8	=	35.62	(74)
North	0.9x	0.77	x	2.78	x	79.99	x	0.4	x	0.8	=	49.31	(74)
North	0.9x	0.77	x	4.47	x	79.99	x	0.4	x	0.8	=	79.29	(74)
North	0.9x	0.77	x	2.15	x	79.99	x	0.4	x	0.8	=	38.14	(74)
North	0.9x	0.77	x	2.78	x	74.68	x	0.4	x	0.8	=	46.04	(74)
North	0.9x	0.77	x	4.47	x	74.68	x	0.4	x	0.8	=	74.02	(74)
North	0.9x	0.77	x	2.15	x	74.68	x	0.4	x	0.8	=	35.6	(74)
North	0.9x	0.77	x	2.78	x	59.25	x	0.4	x	0.8	=	36.52	(74)
North	0.9x	0.77	x	4.47	x	59.25	x	0.4	x	0.8	=	58.73	(74)
North	0.9x	0.77	x	2.15	x	59.25	x	0.4	x	0.8	=	28.25	(74)
North	0.9x	0.77	x	2.78	x	41.52	x	0.4	x	0.8	=	25.59	(74)
North	0.9x	0.77	x	4.47	x	41.52	x	0.4	x	0.8	=	41.15	(74)
North	0.9x	0.77	x	2.15	x	41.52	x	0.4	x	0.8	=	19.79	(74)
North	0.9x	0.77	x	2.78	x	24.19	x	0.4	x	0.8	=	14.91	(74)
North	0.9x	0.77	x	4.47	x	24.19	x	0.4	x	0.8	=	23.98	(74)
North	0.9x	0.77	x	2.15	x	24.19	x	0.4	x	0.8	=	11.53	(74)
North	0.9x	0.77	x	2.78	x	13.12	x	0.4	x	0.8	=	8.09	(74)
North	0.9x	0.77	x	4.47	x	13.12	x	0.4	x	0.8	=	13	(74)
North	0.9x	0.77	x	2.15	x	13.12	x	0.4	x	0.8	=	6.25	(74)
North	0.9x	0.77	x	2.78	x	8.86	x	0.4	x	0.8	=	5.46	(74)
North	0.9x	0.77	x	4.47	x	8.86	x	0.4	x	0.8	=	8.79	(74)
North	0.9x	0.77	x	2.15	x	8.86	x	0.4	x	0.8	=	4.23	(74)
West	0.9x	0.77	x	6.18	x	19.64	x	0.4	x	0.8	=	26.92	(80)
West	0.9x	0.77	x	6.18	x	19.64	x	0.4	x	0.8	=	26.92	(80)
West	0.9x	0.77	x	6.18	x	38.42	x	0.4	x	0.8	=	52.65	(80)
West	0.9x	0.77	x	6.18	x	38.42	x	0.4	x	0.8	=	52.65	(80)
West	0.9x	0.77	x	6.18	x	63.27	x	0.4	x	0.8	=	86.71	(80)
West	0.9x	0.77	x	6.18	x	63.27	x	0.4	x	0.8	=	86.71	(80)
West	0.9x	0.77	x	6.18	x	92.28	x	0.4	x	0.8	=	126.47	(80)
West	0.9x	0.77	x	6.18	x	92.28	x	0.4	x	0.8	=	126.47	(80)
West	0.9x	0.77	x	6.18	x	113.09	x	0.4	x	0.8	=	154.99	(80)
West	0.9x	0.77	x	6.18	x	113.09	x	0.4	x	0.8	=	154.99	(80)

West	0.9x	0.77	x	6.18	x	115.77	x	0.4	x	0.8	=	158.66	(80)
West	0.9x	0.77	x	6.18	x	115.77	x	0.4	x	0.8	=	158.66	(80)
West	0.9x	0.77	x	6.18	x	110.22	x	0.4	x	0.8	=	151.05	(80)
West	0.9x	0.77	x	6.18	x	110.22	x	0.4	x	0.8	=	151.05	(80)
West	0.9x	0.77	x	6.18	x	94.68	x	0.4	x	0.8	=	129.75	(80)
West	0.9x	0.77	x	6.18	x	94.68	x	0.4	x	0.8	=	129.75	(80)
West	0.9x	0.77	x	6.18	x	73.59	x	0.4	x	0.8	=	100.85	(80)
West	0.9x	0.77	x	6.18	x	73.59	x	0.4	x	0.8	=	100.85	(80)
West	0.9x	0.77	x	6.18	x	45.59	x	0.4	x	0.8	=	62.48	(80)
West	0.9x	0.77	x	6.18	x	45.59	x	0.4	x	0.8	=	62.48	(80)
West	0.9x	0.77	x	6.18	x	24.49	x	0.4	x	0.8	=	33.56	(80)
West	0.9x	0.77	x	6.18	x	24.49	x	0.4	x	0.8	=	33.56	(80)
West	0.9x	0.77	x	6.18	x	16.15	x	0.4	x	0.8	=	22.13	(80)
West	0.9x	0.77	x	6.18	x	16.15	x	0.4	x	0.8	=	22.13	(80)

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

(83)m=	76	147.67	245.41	368.55	465.73	484.05	457.77	383	288.25	175.38	94.47	62.75	(83)

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

(84)m=	464.79	534.54	620.22	723.96	801.53	800.85	762.15	692.92	608.06	514.8	456.42	441.51	(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	0.96	0.86	0.67	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=	20.21	20.36	20.6	20.86	20.98	21	21	21	20.98	20.8	20.46	20.18	(87)

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

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

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

(89)m=	0.99	0.99	0.95	0.83	0.62	0.41	0.28	0.32	0.58	0.9	0.99	1	(89)

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

(90)m=	19.13	19.35	19.69	20.04	20.17	20.2	20.2	20.2	20.19	19.97	19.49	19.09	(90)

fLA = Living area ÷ (4) = 0.37 (91)

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

(92)m=	19.53	19.72	20.03	20.34	20.47	20.49	20.5	20.5	20.48	20.28	19.85	19.49	(92)

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

(93)m=	19.53	19.72	20.03	20.34	20.47	20.49	20.5	20.5	20.48	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	0.95	0.83	0.63	0.43	0.3	0.35	0.61	0.91	0.98	0.99	(94)

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

(95)m=	461.47	525.56	588.61	604.11	507.22	344.62	228.31	239.46	368.76	466.1	448.84	439.13	(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=	917.54	891.22	811.7	679.41	519.48	345.54	228.38	239.64	375.67	573.35	758.37	913.77	(97)

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

(98)m=	339.31	245.72	165.97	54.21	9.12	0	0	0	0	79.8	222.86	353.13

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1470.13 (98)

Space heating requirement in kWh/m²/year 21.56 (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		1470.13	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1617.14	(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		2011.65	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2212.81	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.3	(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		143.32	(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) =	143.32	(331)
Energy for lighting (calculated in Appendix L)		303.96	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-577.76	(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	=	623.12	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	19.88	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	643	(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) =				643	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	74.38	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	157.75	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-299.86	(380)
Total CO2, kg/year	sum of (376)…(382) =				575.27	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				8.44	(384)
EI rating (section 14)					93.19	(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: GT 101

Address : GT 101, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	68.2	(1a)	x	2.6	(2a)	=	177.32	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	68.2	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	177.32	(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) =	0.11	(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		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

0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36

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	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57	(24d)

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

(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	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			4.84	x1/[1/(1.4)+ 0.04] =	6.42			(27)
Windows Type 2			4.84	x1/[1/(1.4)+ 0.04] =	6.42			(27)
Windows Type 3			2.18	x1/[1/(1.4)+ 0.04] =	2.89			(27)
Windows Type 4			3.5	x1/[1/(1.4)+ 0.04] =	4.64			(27)
Windows Type 5			1.68	x1/[1/(1.4)+ 0.04] =	2.23			(27)
Floor			68.2	x 0.13 =	8.865999			(28)
Walls	48.39	17.04	31.35	x 0.18 =	5.64			(29)
Total area of elements, m²			116.59					(31)
Party wall			39.03	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) = 37.1 (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 5.44 (36)

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

Total fabric heat loss (33) + (36) = 42.54 (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=	33.78	33.61	33.43	32.62	32.47	31.77	31.77	31.64	32.04	32.47	32.78	33.1	(38)

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

(39)m=	76.32	76.15	75.98	75.17	75.02	74.31	74.31	74.18	74.58	75.02	75.32	75.64	

Average = Sum(39)$_{1…12}$ /12= 75.17 (39)

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

(40)m=	1.12	1.12	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11

Average = Sum(40)$_{1…12}$ /12= 1.1 (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 2.2 (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 86.49 (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=	95.14	91.68	88.22	84.76	81.3	77.84	77.84	81.3	84.76	88.22	91.68	95.14

Total = Sum(44)$_{1…12}$ = 1037.87 (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=	141.09	123.4	127.33	111.01	106.52	91.92	85.18	97.74	98.91	115.27	125.82	136.64

Total = Sum(45)$_{1…12}$ = 1360.81 (45)

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

(46)m=	21.16	18.51	19.1	16.65	15.98	13.79	12.78	14.66	14.84	17.29	18.87	20.5	(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=	187.68	165.48	173.93	156.1	153.11	137.01	131.77	144.33	144	161.86	170.91	183.23	(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=	187.68	165.48	173.93	156.1	153.11	137.01	131.77	144.33	144	161.86	170.91	183.23	

Output from water heater (annual) $_{1...12}$ 1909.43 (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=	84.19	74.7	79.61	72.98	72.69	66.64	65.6	69.77	68.96	75.6	77.91	82.71	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	110.08	(66)

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

(67)m=	17.21	15.29	12.43	9.41	7.04	5.94	6.42	8.34	11.2	14.22	16.59	17.69	(67)

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

(68)m=	193.06	195.06	190.01	179.27	165.7	152.95	144.43	142.43	147.48	158.22	171.79	184.54	(68)

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

(69)m=	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.01	(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=	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	(71)

Water heating gains (Table 5)

(72)m=	113.15	111.16	107.01	101.37	97.71	92.55	88.17	93.78	95.78	101.62	108.21	111.17	(72)

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

(73)m=	382.45	380.53	368.48	349.07	329.47	310.46	298.04	303.58	313.48	333.08	355.62	372.42	(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	2.18	x	10.63	x	0.63	x	0.7	=	7.08	(74)
North	0.9x	0.77	x	3.5	x	10.63	x	0.63	x	0.7	=	11.37	(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	2.18	x	20.32	x	0.63	x	0.7	=	13.54	(74)
North	0.9x	0.77	x	3.5	x	20.32	x	0.63	x	0.7	=	21.74	(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	2.18	x	34.53	x	0.63	x	0.7	=	23.01	(74)
North	0.9x	0.77	x	3.5	x	34.53	x	0.63	x	0.7	=	36.94	(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	2.18	x	55.46	x	0.63	x	0.7	=	36.95	(74)
North	0.9x	0.77	x	3.5	x	55.46	x	0.63	x	0.7	=	59.33	(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	2.18	x	74.72	x	0.63	x	0.7	=	49.78	(74)
North	0.9x	0.77	x	3.5	x	74.72	x	0.63	x	0.7	=	79.92	(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	2.18	x	79.99	x	0.63	x	0.7	=	53.29	(74)
North	0.9x	0.77	x	3.5	x	79.99	x	0.63	x	0.7	=	85.56	(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	2.18	x	74.68	x	0.63	x	0.7	=	49.75	(74)
North	0.9x	0.77	x	3.5	x	74.68	x	0.63	x	0.7	=	79.88	(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	2.18	x	59.25	x	0.63	x	0.7	=	39.47	(74)
North	0.9x	0.77	x	3.5	x	59.25	x	0.63	x	0.7	=	63.37	(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	2.18	x	41.52	x	0.63	x	0.7	=	27.66	(74)
North	0.9x	0.77	x	3.5	x	41.52	x	0.63	x	0.7	=	44.41	(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	2.18	x	24.19	x	0.63	x	0.7	=	16.12	(74)
North	0.9x	0.77	x	3.5	x	24.19	x	0.63	x	0.7	=	25.87	(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	2.18	x	13.12	x	0.63	x	0.7	=	8.74	(74)
North	0.9x	0.77	x	3.5	x	13.12	x	0.63	x	0.7	=	14.03	(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	2.18	x	8.86	x	0.63	x	0.7	=	5.91	(74)
North	0.9x	0.77	x	3.5	x	8.86	x	0.63	x	0.7	=	9.48	(74)
North	0.9x	0.77	x	1.68	x	8.86	x	0.63	x	0.7	=	4.55	(74)
West	0.9x	0.77	x	4.84	x	19.64	x	0.63	x	0.7	=	29.05	(80)
West	0.9x	0.77	x	4.84	x	19.64	x	0.63	x	0.7	=	29.05	(80)
West	0.9x	0.77	x	4.84	x	38.42	x	0.63	x	0.7	=	56.83	(80)
West	0.9x	0.77	x	4.84	x	38.42	x	0.63	x	0.7	=	56.83	(80)
West	0.9x	0.77	x	4.84	x	63.27	x	0.63	x	0.7	=	93.59	(80)
West	0.9x	0.77	x	4.84	x	63.27	x	0.63	x	0.7	=	93.59	(80)
West	0.9x	0.77	x	4.84	x	92.28	x	0.63	x	0.7	=	136.5	(80)
West	0.9x	0.77	x	4.84	x	92.28	x	0.63	x	0.7	=	136.5	(80)
West	0.9x	0.77	x	4.84	x	113.09	x	0.63	x	0.7	=	167.28	(80)
West	0.9x	0.77	x	4.84	x	113.09	x	0.63	x	0.7	=	167.28	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	4.84	x	115.77	x	0.63	x	0.7	=	171.24	(80)
West	0.9x	0.77	x	4.84	x	115.77	x	0.63	x	0.7	=	171.24	(80)
West	0.9x	0.77	x	4.84	x	110.22	x	0.63	x	0.7	=	163.03	(80)
West	0.9x	0.77	x	4.84	x	110.22	x	0.63	x	0.7	=	163.03	(80)
West	0.9x	0.77	x	4.84	x	94.68	x	0.63	x	0.7	=	140.04	(80)
West	0.9x	0.77	x	4.84	x	94.68	x	0.63	x	0.7	=	140.04	(80)
West	0.9x	0.77	x	4.84	x	73.59	x	0.63	x	0.7	=	108.85	(80)
West	0.9x	0.77	x	4.84	x	73.59	x	0.63	x	0.7	=	108.85	(80)
West	0.9x	0.77	x	4.84	x	45.59	x	0.63	x	0.7	=	67.43	(80)
West	0.9x	0.77	x	4.84	x	45.59	x	0.63	x	0.7	=	67.43	(80)
West	0.9x	0.77	x	4.84	x	24.49	x	0.63	x	0.7	=	36.22	(80)
West	0.9x	0.77	x	4.84	x	24.49	x	0.63	x	0.7	=	36.22	(80)
West	0.9x	0.77	x	4.84	x	16.15	x	0.63	x	0.7	=	23.89	(80)
West	0.9x	0.77	x	4.84	x	16.15	x	0.63	x	0.7	=	23.89	(80)

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

(83)m=	82.02	159.37	264.85	397.75	502.62	522.4	494.03	413.35	311.09	189.28	101.95	67.72	(83)

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

(84)m=	464.47	539.9	633.33	746.82	832.09	832.86	792.08	716.92	624.56	522.36	457.57	440.14	(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	0.41	0.47	0.75	0.96	0.99	1	(86)

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

(87)m=	19.88	20.04	20.33	20.68	20.91	20.98	21	20.99	20.93	20.61	20.18	19.85	(87)

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

(88)m=	19.99	19.99	19.99	20	20	20.01	20.01	20.01	20.01	20	20	19.99	(88)

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

(89)m=	1	0.99	0.97	0.88	0.7	0.48	0.32	0.37	0.67	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=	18.49	18.74	19.15	19.64	19.92	20	20.01	20.01	19.96	19.56	18.94	18.46	(90)

fLA = Living area ÷ (4) = 0.37 (91)

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

(92)m=	19	19.22	19.58	20.02	20.28	20.36	20.37	20.37	20.32	19.95	19.4	18.97	(92)

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

(93)m=	19	19.22	19.58	20.02	20.28	20.36	20.37	20.37	20.32	19.95	19.4	18.97	(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	0.99	0.96	0.88	0.72	0.51	0.35	0.41	0.69	0.93	0.99	1	(94)

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

(95)m=	461.53	532.48	609.35	658.79	595.67	421.78	279.56	293.01	433.93	488.1	451.54	437.98	(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=	1122.19	1090.4	994.12	836.1	643.69	428.21	280.34	294.64	463.72	701.14	926.2	1117.1	(97)

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

(98)m=	491.53	374.92	286.26	127.67	35.73	0	0	0	0	158.5	341.76	505.27

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2321.63 (98)

Space heating requirement in kWh/m²/year 34.04 (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)	491.53	374.92	286.26	127.67	35.73	0	0	0	0	158.5	341.76	505.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	525.71	400.98	306.16	136.54	38.21	0	0	0	0	169.51	365.51	540.39	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2483.03 (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)

	187.68	165.48	173.93	156.1	153.11	137.01	131.77	144.33	144	161.86	170.91	183.23	
Efficiency of water heater												79.8	(216)
(217)m=	87.27	86.93	86.13	84.28	81.63	79.8	79.8	79.8	79.8	84.76	86.63	87.38	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	215.07	190.36	201.92	185.21	187.58	171.69	165.13	180.87	180.45	190.97	197.3	209.69

Total = Sum(219a)$_{1...12}$ = 2276.24 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2483.03	
Water heating fuel used		2276.24	
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		303.96	(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	=	536.33	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	491.67	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1028	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	157.75	(268)
Total CO2, kg/year		sum of (265)…(271) =		1224.68	(272)

TER = 26.25 (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 17:35:41

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 51.3m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 102

Address : GT 102, 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)	25.98 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	7.48 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.8 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	0.10 (max. 0.25)	0.10 (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: West	1.5m²	
Windows facing: West	9.25m²	
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	0.1 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: GT 102

Address : GT 102, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	51.3	(1a)	x	2.6	(2a)	=	133.38	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.3	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			133.38	(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		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(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

0.1	0.1	0.09	0.09	0.08	0.07	0.07	0.07	0.08	0.08	0.09	0.09

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=	0.22	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.2	0.2	0.2	0.21	(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=	0.22	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.2	0.2	0.2	0.21	(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			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 2			9.25	x1/[1/(1.4)+ 0.04]	=	12.26			(27)
Floor			51.3	x 0.1	=	5.13			(28)
Walls	23.92	10.75	13.17	x 0.12	=	1.58			(29)
Total area of elements, m²			75.22						(31)
Party wall			49.92	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) = 20.96 (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 4.13 (36)

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

Total fabric heat loss (33) + (36) = 25.1 (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=	9.52	9.44	9.35	8.92	8.84	8.41	8.41	8.33	8.58	8.84	9.01	9.18	(38)

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

(39)m=	34.62	34.53	34.45	34.02	33.94	33.51	33.51	33.42	33.68	33.94	34.11	34.28	

Average = Sum(39)$_{1…12}$ /12= 34 (39)

DER WorkSheet: New dwelling design stage

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

(40)m=	0.67	0.67	0.67	0.66	0.66	0.65	0.65	0.65	0.66	0.66	0.66	0.67

Average = Sum(40)$_{1…12}$ /12= 0.66 (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 1.73 (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 75.25 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more 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=	82.77	79.76	76.75	73.74	70.73	67.72	67.72	70.73	73.74	76.75	79.76	82.77	
										Total = Sum(44)$_{1…12}$ =		903	(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=	122.75	107.36	110.79	96.59	92.68	79.97	74.11	85.04	86.05	100.29	109.47	118.88	
										Total = Sum(45)$_{1…12}$ =		1183.97	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	18.41	16.1	16.62	14.49	13.9	12	11.12	12.76	12.91	15.04	16.42	17.83	(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)

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=	178.03	157.29	166.06	150.08	147.95	133.47	129.38	140.32	139.55	155.56	162.97	174.16	(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=	178.03	157.29	166.06	150.08	147.95	133.47	129.38	140.32	139.55	155.56	162.97	174.16	

Output from water heater (annual)$_{1...12}$ 1834.81 (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=	85.04	75.64	81.06	74.91	75.04	69.39	68.86	72.5	71.41	77.57	79.19	83.75	(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=	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	(66)

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

(67)m=	13.43	11.93	9.7	7.34	5.49	4.63	5.01	6.51	8.74	11.09	12.95	13.8	(67)

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

(68)m=	150.61	152.17	148.23	139.85	129.27	119.32	112.67	111.11	115.05	123.43	134.02	143.96	(68)

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

(69)m=	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	(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=	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	(71)

Water heating gains (Table 5)

(72)m=	114.3	112.56	108.95	104.04	100.86	96.37	92.56	97.44	99.18	104.26	109.99	112.57	(72)

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

(73)m=	327.26	325.58	315.81	300.16	284.54	269.25	259.16	263.99	271.89	287.71	305.88	319.26	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
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	9.25	x	19.64	x	0.4	x	0.8	=	40.29	(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	9.25	x	38.42	x	0.4	x	0.8	=	78.81	(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	9.25	x	63.27	x	0.4	x	0.8	=	129.79	(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	9.25	x	92.28	x	0.4	x	0.8	=	189.29	(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	9.25	x	113.09	x	0.4	x	0.8	=	231.98	(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	9.25	x	115.77	x	0.4	x	0.8	=	237.48	(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	9.25	x	110.22	x	0.4	x	0.8	=	226.09	(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	9.25	x	94.68	x	0.4	x	0.8	=	194.21	(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	9.25	x	73.59	x	0.4	x	0.8	=	150.95	(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	9.25	x	45.59	x	0.4	x	0.8	=	93.52	(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	9.25	x	24.49	x	0.4	x	0.8	=	50.23	(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	9.25	x	16.15	x	0.4	x	0.8	=	33.13	(80)

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

(83)m=	46.82	91.59	150.84	219.99	269.6	275.99	262.75	225.7	175.43	108.68	58.38	38.5	(83)

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

(84)m=	374.08	417.17	466.65	520.15	554.14	545.24	521.91	489.69	447.32	396.39	364.26	357.76	(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	0.92	0.76	0.57	0.39	0.28	0.31	0.52	0.83	0.97	0.99	(86)

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

(87)m=	20.58	20.7	20.85	20.97	21	21	21	21	21	20.95	20.76	20.56	(87)

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

(88)m=	20.36	20.36	20.37	20.37	20.37	20.38	20.38	20.38	20.38	20.37	20.37	20.37	(88)

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

(89)m=	0.99	0.96	0.9	0.73	0.53	0.36	0.24	0.27	0.47	0.8	0.96	0.99	(89)

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

(90)m=	19.81	19.98	20.19	20.34	20.37	20.38	20.38	20.38	20.38	20.33	20.07	19.78	(90)

fLA = Living area ÷ (4) = 0.5 (91)

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

(92)m=	20.2	20.34	20.52	20.65	20.68	20.69	20.69	20.69	20.69	20.64	20.41	20.17	(92)

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

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(93)m=	20.2	20.34	20.52	20.65	20.68	20.69	20.69	20.69	20.69	20.64	20.41	20.17	(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	0.9	0.74	0.55	0.37	0.26	0.29	0.5	0.81	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	368.12	402.34	421.04	387.37	303.68	204	137.03	143.39	221.45	321.5	349.78	353.4	(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=	550.26	533.05	483.03	399.89	304.84	204.05	137.03	143.39	221.85	340.65	453.98	547.25	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	135.51	87.84	46.12	9.01	0.86	0	0	0	0	14.25	75.02	144.22	

Total per year (kWh/year) = Sum(98)1...5,9...12 =	512.84	(98)
Space heating requirement in kWh/m²/year	10	(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		512.84	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	564.12	(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		1834.81	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2018.3	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	25.82	(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		101.7	(330a)

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warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	101.7	(331)
Energy for lighting (calculated in Appendix L)		237.12	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-434.4	(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	=	420.15	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	13.4	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	433.55	(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) =				433.55	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	52.78	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	123.07	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-225.45	(380)
Total CO2, kg/year	sum of (376)…(382) =				383.95	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				7.48	(384)
EI rating (section 14)					94.66	(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: GT 102

Address : GT 102, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	51.3	(1a) x	2.6	(2a) =	133.38	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		133.38	(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) =	0.15	(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		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(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

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

0.4	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36

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			1.5	x1/[1/(1.4)+ 0.04] =	1.99			(27)
Windows Type 2			9.25	x1/[1/(1.4)+ 0.04] =	12.26			(27)
Floor			51.3	x 0.13 =	6.669			(28)
Walls	23.92	10.75	13.17	x 0.18 =	2.37			(29)
Total area of elements, m²			75.22					(31)
Party wall			49.92	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) = 23.29 (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 2.71 (36)

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

Total fabric heat loss (33) + (36) = 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=	25.44	25.31	25.18	24.57	24.45	23.92	23.92	23.82	24.12	24.45	24.68	24.93	(38)

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

(39)m=	51.45	51.31	51.18	50.57	50.45	49.92	49.92	49.82	50.12	50.45	50.69	50.93	

Average = Sum(39)$_{1…12}$ /12= 50.57 (39)

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

(40)m=	1	1	1	0.99	0.98	0.97	0.97	0.97	0.98	0.98	0.99	0.99

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 1.73 (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 75.25 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more 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=	82.77	79.76	76.75	73.74	70.73	67.72	67.72	70.73	73.74	76.75	79.76	82.77	
										Total = Sum(44)$_{1...12}$ =		903	(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=	122.75	107.36	110.79	96.59	92.68	79.97	74.11	85.04	86.05	100.29	109.47	118.88	
										Total = Sum(45)$_{1...12}$ =		1183.97	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	18.41	16.1	16.62	14.49	13.9	12	11.12	12.76	12.91	15.04	16.42	17.83	(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)

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=	169.35	149.45	157.38	141.68	139.27	125.06	120.7	131.63	131.15	146.88	154.56	165.47	(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=	169.35	149.45	157.38	141.68	139.27	125.06	120.7	131.63	131.15	146.88	154.56	165.47	

Output from water heater (annual)$_{1...12}$ 1732.59 (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=	78.09	69.37	74.11	68.19	68.09	62.66	61.92	65.55	64.69	70.62	72.47	76.8	(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=	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	13.47	11.96	9.73	7.36	5.5	4.65	5.02	6.53	8.76	11.12	12.98	13.84	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	150.61	152.17	148.23	139.85	129.27	119.32	112.67	111.11	115.05	123.43	134.02	143.96	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	(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=	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	(71)
Water heating gains (Table 5)													
(72)m=	104.96	103.22	99.61	94.71	91.52	87.03	83.22	88.11	89.84	94.92	100.66	103.23	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	320.96	319.28	309.5	293.85	278.22	262.93	252.84	257.67	265.58	281.4	299.58	312.96	(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)	
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	9.25	x	19.64	x	0.63	x	0.7	=	55.52	(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	9.25	x	38.42	x	0.63	x	0.7	=	108.61	(80)
West	0.9x	0.77	x	1.5	x	63.27	x	0.63	x	0.7	=	29.01	(80)

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West	0.9x	0.77	x	9.25	x	63.27	x	0.63	x	0.7	=	178.87	(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	9.25	x	92.28	x	0.63	x	0.7	=	260.87	(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	9.25	x	113.09	x	0.63	x	0.7	=	319.7	(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	9.25	x	115.77	x	0.63	x	0.7	=	327.27	(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	9.25	x	110.22	x	0.63	x	0.7	=	311.58	(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	9.25	x	94.68	x	0.63	x	0.7	=	267.64	(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	9.25	x	73.59	x	0.63	x	0.7	=	208.03	(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	9.25	x	45.59	x	0.63	x	0.7	=	128.88	(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	9.25	x	24.49	x	0.63	x	0.7	=	69.23	(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	9.25	x	16.15	x	0.63	x	0.7	=	45.66	(80)

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

(83)m=	64.52	126.22	207.87	303.17	371.55	380.35	362.1	311.04	241.77	149.78	80.46	53.06	(83)

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

(84)m=	385.49	445.51	517.37	597.02	649.77	643.27	614.95	568.71	507.34	431.18	380.04	366.02	(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	0.86	0.69	0.49	0.36	0.4	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	20.27	20.53	20.82	20.96	20.99	21	21	20.98	20.76	20.38	20.07	(87)

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

(88)m=	20.08	20.08	20.09	20.1	20.1	20.11	20.11	20.11	20.1	20.1	20.09	20.09	(88)

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

(89)m=	0.99	0.98	0.94	0.83	0.63	0.43	0.28	0.32	0.58	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=	18.9	19.14	19.51	19.9	20.06	20.1	20.11	20.11	20.09	19.84	19.3	18.86	(90)

fLA = Living area ÷ (4) = 0.5 (91)

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

(92)m=	19.5	19.7	20.02	20.35	20.51	20.55	20.55	20.55	20.53	20.29	19.84	19.46	(92)

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

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(93)m=	19.5	19.7	20.02	20.35	20.51	20.55	20.55	20.55	20.53	20.29	19.84	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	0.94	0.84	0.66	0.46	0.32	0.36	0.62	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	381.77	436.09	487.77	499.97	426.86	294.94	196.98	206.37	313.06	387.6	372.13	363.29	(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=	781.87	759.58	692.06	579.14	444.27	296.81	197.17	206.76	322.17	489.12	645.62	777.35	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	297.67	217.38	151.99	57.01	12.95	0	0	0	0	75.53	196.92	308.06	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1317.51 (98)

Space heating requirement in kWh/m²/year 25.68 (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)														
	297.67	217.38	151.99	57.01	12.95	0	0	0	0	75.53	196.92	308.06		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	318.37	232.5	162.56	60.97	13.85	0	0	0	0	80.78	210.6	329.48		
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1409.1	(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)

Water heating

Output from water heater (calculated above)														
	169.35	149.45	157.38	141.68	139.27	125.06	120.7	131.63	131.15	146.88	154.56	165.47		
Efficiency of water heater													79.8	(216)
(217)m=	86.3	85.81	84.72	82.6	80.61	79.8	79.8	79.8	79.8	83.14	85.46	86.45		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	196.22	174.15	185.76	171.52	172.77	156.72	151.26	164.95	164.34	176.67	180.86	191.41		
Total = Sum(219a)$_{1...12}$ =													2086.65	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1409.1

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Water heating fuel used			2086.65	
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			237.81	(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	=	304.37	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	450.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =				755.08	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	123.42	(268)
Total CO2, kg/year			sum of (265)…(271) =		917.43	(272)

TER =	25.98	(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 17:35:57

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE — Total Floor Area: 74.8m²

Site Reference :	Maitland Park Estate	**Plot Reference:**	GT 103
Address :	GT 103, 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)	24.38 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	7.37 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.9 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	0.10 (max. 0.25)	0.10 (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: East	4.01m²	
Windows facing: South	3.95m²	
Windows facing: South	2.24m²	
Windows facing: South	2.24m²	
Windows facing: South	4.01m²	
Windows facing: West	4.01m²	
Windows facing: West	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
Floors U-value	0.1 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: GT 103

Address : GT 103, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74.8	(1a) x	2.6	(2a) =	194.48	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74.8	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		194.48	(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

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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	
Windows Type 1			4.01		x1/[1/(1.4)+ 0.04]	=	5.32			(27)
Windows Type 2			3.95		x1/[1/(1.4)+ 0.04]	=	5.24			(27)
Windows Type 3			2.24		x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 4			2.24		x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 5			4.01		x1/[1/(1.4)+ 0.04]	=	5.32			(27)
Windows Type 6			4.01		x1/[1/(1.4)+ 0.04]	=	5.32			(27)
Windows Type 7			1.5		x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Floor			74.8	x	0.1	=	7.48			(28)
Walls	61.39	21.96	39.43	x	0.12	=	4.73			(29)
Total area of elements, m²			136.19							(31)
Party wall			52.57	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) =	41.32	(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		10.08	(36)

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

Total fabric heat loss	(33) + (36) =	51.4	(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=	15.11	14.96	14.81	14.07	13.92	13.18	13.18	13.03	13.48	13.92	14.22	14.52	(38)

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

(39)m=	66.51	66.36	66.21	65.47	65.32	64.58	64.58	64.43	64.88	65.32	65.62	65.92	

Average = $Sum(39)_{1...12}$ /12= 65.43 (39)

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

(40)m=	0.89	0.89	0.89	0.88	0.87	0.86	0.86	0.86	0.87	0.88	0.88	0.88	

Average = $Sum(40)_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.36 (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 90.17 (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=	99.19	95.58	91.98	88.37	84.76	81.16	81.16	84.76	88.37	91.98	95.58	99.19	

Total = $Sum(44)_{1...12}$ = 1082.09 (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=	147.1	128.65	132.76	115.74	111.06	95.83	88.8	101.9	103.12	120.18	131.18	142.46	

Total = $Sum(45)_{1...12}$ = 1418.79 (45)

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

(46)m=	22.06	19.3	19.91	17.36	16.66	14.38	13.32	15.29	15.47	18.03	19.68	21.37	(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=	202.38	178.58	188.04	169.24	166.33	149.33	144.08	157.18	156.61	175.45	184.68	197.73	(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=	202.38	178.58	188.04	169.24	166.33	149.33	144.08	157.18	156.61	175.45	184.68	197.73

Output from water heater (annual)$_{1...12}$ — 2069.63 (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=	93.13	82.72	88.36	81.28	81.15	74.66	73.75	78.1	77.08	84.18	86.41	91.59	(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=	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18.56	16.49	13.41	10.15	7.59	6.41	6.92	9	12.08	15.33	17.9	19.08	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	208.23	210.39	204.95	193.36	178.72	164.97	155.78	153.62	159.07	170.66	185.29	199.04	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	(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=	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	(71)
Water heating gains (Table 5)													
(72)m=	125.18	123.09	118.77	112.89	109.07	103.69	99.12	104.98	107.06	113.15	120.02	123.1	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	410.32	408.33	395.48	374.75	353.73	333.42	320.18	325.95	336.55	357.49	381.56	399.58	(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)

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East	0.9x	0.77	x	4.01	x	19.64	x	0.4	x	0.8	=	17.47	(76)
East	0.9x	0.77	x	4.01	x	38.42	x	0.4	x	0.8	=	34.17	(76)
East	0.9x	0.77	x	4.01	x	63.27	x	0.4	x	0.8	=	56.27	(76)
East	0.9x	0.77	x	4.01	x	92.28	x	0.4	x	0.8	=	82.06	(76)
East	0.9x	0.77	x	4.01	x	113.09	x	0.4	x	0.8	=	100.57	(76)
East	0.9x	0.77	x	4.01	x	115.77	x	0.4	x	0.8	=	102.95	(76)
East	0.9x	0.77	x	4.01	x	110.22	x	0.4	x	0.8	=	98.01	(76)
East	0.9x	0.77	x	4.01	x	94.68	x	0.4	x	0.8	=	84.19	(76)
East	0.9x	0.77	x	4.01	x	73.59	x	0.4	x	0.8	=	65.44	(76)
East	0.9x	0.77	x	4.01	x	45.59	x	0.4	x	0.8	=	40.54	(76)
East	0.9x	0.77	x	4.01	x	24.49	x	0.4	x	0.8	=	21.78	(76)
East	0.9x	0.77	x	4.01	x	16.15	x	0.4	x	0.8	=	14.36	(76)
South	0.9x	0.77	x	3.95	x	46.75	x	0.4	x	0.8	=	40.95	(78)
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	2.24	x	46.75	x	0.4	x	0.8	=	23.22	(78)
South	0.9x	0.77	x	4.01	x	46.75	x	0.4	x	0.8	=	41.57	(78)
South	0.9x	0.77	x	3.95	x	76.57	x	0.4	x	0.8	=	67.07	(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	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	x	4.01	x	76.57	x	0.4	x	0.8	=	68.09	(78)
South	0.9x	0.77	x	3.95	x	97.53	x	0.4	x	0.8	=	85.43	(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	2.24	x	97.53	x	0.4	x	0.8	=	48.45	(78)
South	0.9x	0.77	x	4.01	x	97.53	x	0.4	x	0.8	=	86.73	(78)
South	0.9x	0.77	x	3.95	x	110.23	x	0.4	x	0.8	=	96.56	(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	2.24	x	110.23	x	0.4	x	0.8	=	54.76	(78)
South	0.9x	0.77	x	4.01	x	110.23	x	0.4	x	0.8	=	98.03	(78)
South	0.9x	0.77	x	3.95	x	114.87	x	0.4	x	0.8	=	100.62	(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	2.24	x	114.87	x	0.4	x	0.8	=	57.06	(78)
South	0.9x	0.77	x	4.01	x	114.87	x	0.4	x	0.8	=	102.15	(78)
South	0.9x	0.77	x	3.95	x	110.55	x	0.4	x	0.8	=	96.83	(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	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	x	4.01	x	110.55	x	0.4	x	0.8	=	98.31	(78)
South	0.9x	0.77	x	3.95	x	108.01	x	0.4	x	0.8	=	94.61	(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	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	x	4.01	x	108.01	x	0.4	x	0.8	=	96.05	(78)
South	0.9x	0.77	x	3.95	x	104.89	x	0.4	x	0.8	=	91.88	(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	2.24	x	104.89	x	0.4	x	0.8	=	52.11	(78)
South	0.9x	0.77	x	4.01	x	104.89	x	0.4	x	0.8	=	93.28	(78)
South	0.9x	0.77	x	3.95	x	101.89	x	0.4	x	0.8	=	89.25	(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	2.24	x	101.89	x	0.4	x	0.8	=	50.61	(78)
South	0.9x	0.77	x	4.01	x	101.89	x	0.4	x	0.8	=	90.6	(78)
South	0.9x	0.77	x	3.95	x	82.59	x	0.4	x	0.8	=	72.34	(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	2.24	x	82.59	x	0.4	x	0.8	=	41.02	(78)
South	0.9x	0.77	x	4.01	x	82.59	x	0.4	x	0.8	=	73.44	(78)
South	0.9x	0.77	x	3.95	x	55.42	x	0.4	x	0.8	=	48.54	(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	2.24	x	55.42	x	0.4	x	0.8	=	27.53	(78)
South	0.9x	0.77	x	4.01	x	55.42	x	0.4	x	0.8	=	49.28	(78)
South	0.9x	0.77	x	3.95	x	40.4	x	0.4	x	0.8	=	35.39	(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	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)
South	0.9x	0.77	x	4.01	x	40.4	x	0.4	x	0.8	=	35.92	(78)
West	0.9x	0.77	x	4.01	x	19.64	x	0.4	x	0.8	=	17.47	(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	4.01	x	38.42	x	0.4	x	0.8	=	34.17	(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	4.01	x	63.27	x	0.4	x	0.8	=	56.27	(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	4.01	x	92.28	x	0.4	x	0.8	=	82.06	(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	4.01	x	113.09	x	0.4	x	0.8	=	100.57	(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	4.01	x	115.77	x	0.4	x	0.8	=	102.95	(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	4.01	x	110.22	x	0.4	x	0.8	=	98.01	(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	4.01	x	94.68	x	0.4	x	0.8	=	84.19	(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	4.01	x	73.59	x	0.4	x	0.8	=	65.44	(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	4.01	x	45.59	x	0.4	x	0.8	=	40.54	(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	4.01	x	24.49	x	0.4	x	0.8	=	21.78	(80)
West	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(80)

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West	0.9x	0.77	x	4.01	x	16.15	x	0.4	x	0.8	=	14.36	(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=	170.44	292.34	402.65	498.92	555.65	549.38	530.66	489.25	436.43	324.07	204.58	145.54	(83)

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

(84)m=	580.76	700.67	798.12	873.67	909.38	882.8	850.84	815.2	772.98	681.57	586.14	545.12	(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	0.97	0.93	0.82	0.65	0.47	0.33	0.36	0.57	0.86	0.98	0.99	(86)

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

(87)m=	20.29	20.49	20.71	20.9	20.98	21	21	21	20.99	20.88	20.55	20.25	(87)

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

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

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

(89)m=	0.99	0.97	0.91	0.78	0.6	0.41	0.27	0.3	0.51	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=	19.25	19.53	19.83	20.08	20.17	20.2	20.2	20.2	20.19	20.06	19.62	19.19	(90)

fLA = Living area ÷ (4) = 0.36 (91)

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

(92)m=	19.62	19.87	20.15	20.37	20.46	20.48	20.49	20.49	20.48	20.36	19.96	19.57	(92)

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

(93)m=	19.62	19.87	20.15	20.37	20.46	20.48	20.49	20.49	20.48	20.36	19.96	19.57	(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	0.79	0.62	0.43	0.29	0.32	0.53	0.83	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	573.01	675.08	725.55	690.11	560.39	378.99	250.87	263.18	410.05	567.35	566.57	539.85	(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=	1019.1	993.65	903.64	751.1	572.25	380	250.94	263.32	413.75	637.31	843.65	1013.3	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	331.89	214.08	132.5	43.91	8.82	0	0	0	0	52.05	199.5	352.25	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1335 (98)

Space heating requirement in kWh/m²/year 17.85 (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		1335	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1468.5	(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		2069.63	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2276.59	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	37.45	(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		157.19	(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) =	157.19	(331)
Energy for lighting (calculated in Appendix L)		327.85	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-633.9	(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	=	609.31	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.44	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	628.75	(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) =			628.75	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	81.58	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	170.15	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-328.99	(380)
Total CO2, kg/year	sum of (376)…(382) =			551.49	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			7.37	(384)
EI rating (section 14)				93.83	(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: GT 103

Address : GT 103, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74.8	(1a) x	2.6	(2a) =	194.48	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74.8	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	194.48	(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		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	0.6	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	0.6	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			3.41		x1/[1/(1.4)+ 0.04]	=	4.52			(27)
Windows Type 2			3.36		x1/[1/(1.4)+ 0.04]	=	4.45			(27)
Windows Type 3			1.91		x1/[1/(1.4)+ 0.04]	=	2.53			(27)
Windows Type 4			1.91		x1/[1/(1.4)+ 0.04]	=	2.53			(27)
Windows Type 5			3.41		x1/[1/(1.4)+ 0.04]	=	4.52			(27)
Windows Type 6			3.41		x1/[1/(1.4)+ 0.04]	=	4.52			(27)
Windows Type 7			1.28		x1/[1/(1.4)+ 0.04]	=	1.7			(27)
Floor			74.8	x	0.13	=	9.724			(28)
Walls	61.39	18.69	42.7	x	0.18	=	7.69			(29)
Total area of elements, m²			136.19							(31)
Party wall			52.57	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) = 42.19 (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 6.57 (36)

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

Total fabric heat loss (33) + (36) = 48.76 (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=	39.38	39.1	38.82	37.52	37.27	36.14	36.14	35.93	36.58	37.27	37.77	38.28		(38)

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

(39)m=	88.14	87.86	87.58	86.28	86.03	84.9	84.9	84.69	85.33	86.03	86.53	87.04		
										Average = Sum(39)$_{1...12}$ /12=			86.28	(39)

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

(40)m=	1.18	1.17	1.17	1.15	1.15	1.13	1.13	1.13	1.14	1.15	1.16	1.16		
										Average = Sum(40)$_{1...12}$ /12=			1.15	(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 90.17 (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=	99.19	95.58	91.98	88.37	84.76	81.16	81.16	84.76	88.37	91.98	95.58	99.19		
										Total = Sum(44)$_{1...12}$ =			1082.09	(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=	147.1	128.65	132.76	115.74	111.06	95.83	88.8	101.9	103.12	120.18	131.18	142.46		
										Total = Sum(45)$_{1...12}$ =			1418.79	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)														
(46)m=	22.06	19.3	19.91	17.36	16.66	14.38	13.32	15.29	15.47	18.03	19.68	21.37		(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)

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

(57)m=	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=	193.69	170.74	179.35	160.83	157.65	140.93	135.4	148.5	148.21	166.77	176.28	189.05	(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=	193.69	170.74	179.35	160.83	157.65	140.93	135.4	148.5	148.21	166.77	176.28	189.05

Output from water heater (annual)$_{1...12}$ | 1967.41 | (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=	86.19	76.45	81.42	74.56	74.2	67.94	66.8	71.16	70.36	77.24	79.69	84.64	(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=	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	(66)

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

(67)m=	18.56	16.49	13.41	10.15	7.59	6.41	6.92	9	12.08	15.33	17.9	19.08	(67)

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

(68)m=	208.23	210.39	204.95	193.36	178.72	164.97	155.78	153.62	159.07	170.66	185.29	199.04	(68)

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

(69)m=	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	(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=	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	(71)

Water heating gains (Table 5)

(72)m=	115.84	113.76	109.43	103.55	99.73	94.36	89.79	95.64	97.72	103.81	110.68	113.77	(72)

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

(73)m=	403.99	401.99	389.14	368.41	347.4	327.09	313.85	319.62	330.22	351.16	375.22	393.24	(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)

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East	0.9x	0.77	x	3.41	x	19.64	x	0.63	x	0.7	=	20.47	(76)
East	0.9x	0.77	x	3.41	x	38.42	x	0.63	x	0.7	=	40.04	(76)
East	0.9x	0.77	x	3.41	x	63.27	x	0.63	x	0.7	=	65.94	(76)
East	0.9x	0.77	x	3.41	x	92.28	x	0.63	x	0.7	=	96.17	(76)
East	0.9x	0.77	x	3.41	x	113.09	x	0.63	x	0.7	=	117.86	(76)
East	0.9x	0.77	x	3.41	x	115.77	x	0.63	x	0.7	=	120.65	(76)
East	0.9x	0.77	x	3.41	x	110.22	x	0.63	x	0.7	=	114.86	(76)
East	0.9x	0.77	x	3.41	x	94.68	x	0.63	x	0.7	=	98.67	(76)
East	0.9x	0.77	x	3.41	x	73.59	x	0.63	x	0.7	=	76.69	(76)
East	0.9x	0.77	x	3.41	x	45.59	x	0.63	x	0.7	=	47.51	(76)
East	0.9x	0.77	x	3.41	x	24.49	x	0.63	x	0.7	=	25.52	(76)
East	0.9x	0.77	x	3.41	x	16.15	x	0.63	x	0.7	=	16.83	(76)
South	0.9x	0.77	x	3.36	x	46.75	x	0.63	x	0.7	=	48.01	(78)
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	1.91	x	46.75	x	0.63	x	0.7	=	27.29	(78)
South	0.9x	0.77	x	3.41	x	46.75	x	0.63	x	0.7	=	48.72	(78)
South	0.9x	0.77	x	3.36	x	76.57	x	0.63	x	0.7	=	78.62	(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	1.91	x	76.57	x	0.63	x	0.7	=	44.69	(78)
South	0.9x	0.77	x	3.41	x	76.57	x	0.63	x	0.7	=	79.79	(78)
South	0.9x	0.77	x	3.36	x	97.53	x	0.63	x	0.7	=	100.15	(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	1.91	x	97.53	x	0.63	x	0.7	=	56.93	(78)
South	0.9x	0.77	x	3.41	x	97.53	x	0.63	x	0.7	=	101.64	(78)
South	0.9x	0.77	x	3.36	x	110.23	x	0.63	x	0.7	=	113.2	(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	1.91	x	110.23	x	0.63	x	0.7	=	64.35	(78)
South	0.9x	0.77	x	3.41	x	110.23	x	0.63	x	0.7	=	114.88	(78)
South	0.9x	0.77	x	3.36	x	114.87	x	0.63	x	0.7	=	117.96	(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	1.91	x	114.87	x	0.63	x	0.7	=	67.05	(78)
South	0.9x	0.77	x	3.41	x	114.87	x	0.63	x	0.7	=	119.71	(78)
South	0.9x	0.77	x	3.36	x	110.55	x	0.63	x	0.7	=	113.52	(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	1.91	x	110.55	x	0.63	x	0.7	=	64.53	(78)
South	0.9x	0.77	x	3.41	x	110.55	x	0.63	x	0.7	=	115.21	(78)
South	0.9x	0.77	x	3.36	x	108.01	x	0.63	x	0.7	=	110.91	(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	1.91	x	108.01	x	0.63	x	0.7	=	63.05	(78)
South	0.9x	0.77	x	3.41	x	108.01	x	0.63	x	0.7	=	112.56	(78)
South	0.9x	0.77	x	3.36	x	104.89	x	0.63	x	0.7	=	107.71	(78)

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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	1.91	x	104.89	x	0.63	x	0.7	=	61.23	(78)
South	0.9x	0.77	x	3.41	x	104.89	x	0.63	x	0.7	=	109.31	(78)
South	0.9x	0.77	x	3.36	x	101.89	x	0.63	x	0.7	=	104.62	(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	1.91	x	101.89	x	0.63	x	0.7	=	59.47	(78)
South	0.9x	0.77	x	3.41	x	101.89	x	0.63	x	0.7	=	106.18	(78)
South	0.9x	0.77	x	3.36	x	82.59	x	0.63	x	0.7	=	84.8	(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	1.91	x	82.59	x	0.63	x	0.7	=	48.21	(78)
South	0.9x	0.77	x	3.41	x	82.59	x	0.63	x	0.7	=	86.07	(78)
South	0.9x	0.77	x	3.36	x	55.42	x	0.63	x	0.7	=	56.91	(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	1.91	x	55.42	x	0.63	x	0.7	=	32.35	(78)
South	0.9x	0.77	x	3.41	x	55.42	x	0.63	x	0.7	=	57.75	(78)
South	0.9x	0.77	x	3.36	x	40.4	x	0.63	x	0.7	=	41.48	(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	1.91	x	40.4	x	0.63	x	0.7	=	23.58	(78)
South	0.9x	0.77	x	3.41	x	40.4	x	0.63	x	0.7	=	42.1	(78)
West	0.9x	0.77	x	3.41	x	19.64	x	0.63	x	0.7	=	20.47	(80)
West	0.9x	0.77	x	1.28	x	19.64	x	0.63	x	0.7	=	7.68	(80)
West	0.9x	0.77	x	3.41	x	38.42	x	0.63	x	0.7	=	40.04	(80)
West	0.9x	0.77	x	1.28	x	38.42	x	0.63	x	0.7	=	15.03	(80)
West	0.9x	0.77	x	3.41	x	63.27	x	0.63	x	0.7	=	65.94	(80)
West	0.9x	0.77	x	1.28	x	63.27	x	0.63	x	0.7	=	24.75	(80)
West	0.9x	0.77	x	3.41	x	92.28	x	0.63	x	0.7	=	96.17	(80)
West	0.9x	0.77	x	1.28	x	92.28	x	0.63	x	0.7	=	36.1	(80)
West	0.9x	0.77	x	3.41	x	113.09	x	0.63	x	0.7	=	117.86	(80)
West	0.9x	0.77	x	1.28	x	113.09	x	0.63	x	0.7	=	44.24	(80)
West	0.9x	0.77	x	3.41	x	115.77	x	0.63	x	0.7	=	120.65	(80)
West	0.9x	0.77	x	1.28	x	115.77	x	0.63	x	0.7	=	45.29	(80)
West	0.9x	0.77	x	3.41	x	110.22	x	0.63	x	0.7	=	114.86	(80)
West	0.9x	0.77	x	1.28	x	110.22	x	0.63	x	0.7	=	43.12	(80)
West	0.9x	0.77	x	3.41	x	94.68	x	0.63	x	0.7	=	98.67	(80)
West	0.9x	0.77	x	1.28	x	94.68	x	0.63	x	0.7	=	37.04	(80)
West	0.9x	0.77	x	3.41	x	73.59	x	0.63	x	0.7	=	76.69	(80)
West	0.9x	0.77	x	1.28	x	73.59	x	0.63	x	0.7	=	28.79	(80)
West	0.9x	0.77	x	3.41	x	45.59	x	0.63	x	0.7	=	47.51	(80)
West	0.9x	0.77	x	1.28	x	45.59	x	0.63	x	0.7	=	17.83	(80)
West	0.9x	0.77	x	3.41	x	24.49	x	0.63	x	0.7	=	25.52	(80)
West	0.9x	0.77	x	1.28	x	24.49	x	0.63	x	0.7	=	9.58	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	3.41	x	16.15	x	0.63	x	0.7	=	16.83	(80)
West	0.9x	0.77	x	1.28	x	16.15	x	0.63	x	0.7	=	6.32	(80)

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

(83)m=	199.93	342.92	472.29	585.2	651.73	644.37	622.42	573.85	511.91	380.14	239.98	170.73	(83)

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

(84)m=	603.92	744.91	861.43	953.61	999.13	971.45	936.26	893.47	842.13	731.29	615.2	563.97	(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=	0.99	0.98	0.95	0.87	0.73	0.55	0.4	0.43	0.66	0.91	0.98	0.99	(86)

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

(87)m=	19.91	20.14	20.43	20.73	20.91	20.98	21	21	20.96	20.71	20.25	19.87	(87)

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

(88)m=	19.94	19.94	19.94	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.95	19.95	(88)

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

(89)m=	0.99	0.97	0.93	0.83	0.67	0.46	0.31	0.34	0.58	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=	18.51	18.85	19.26	19.67	19.88	19.96	19.97	19.97	19.94	19.65	19.01	18.46	(90)

fLA = Living area ÷ (4) = | 0.36 | (91)

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

(92)m=	19.01	19.31	19.68	20.05	20.25	20.33	20.34	20.34	20.3	20.03	19.46	18.97	(92)

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

(93)m=	19.01	19.31	19.68	20.05	20.25	20.33	20.34	20.34	20.3	20.03	19.46	18.97	(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	0.69	0.49	0.34	0.37	0.6	0.87	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	596.37	721.63	799.26	798.39	686.16	479	316.57	332.24	509.47	639.25	598.13	558.69	(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=	1296.71	1266.29	1154.22	961.73	735.64	486.34	317.43	333.63	529.48	811.29	1069.24	1285.33	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	521.05	366.02	264.09	117.6	36.81	0	0	0	0	127.99	339.2	540.62	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = | 2313.38 | (98)

Space heating requirement in kWh/m²/year | 30.93 | (99)

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

Space heating:

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

TER WorkSheet: New dwelling design stage

Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		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)	521.05	366.02	264.09	117.6	36.81	0	0	0	0	127.99	339.2	540.62		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	557.27	391.46	282.45	125.78	39.37	0	0	0	0	136.89	362.78	578.2		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2474.21	(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)	193.69	170.74	179.35	160.83	157.65	140.93	135.4	148.5	148.21	166.77	176.28	189.05		
Efficiency of water heater													79.8	(216)
(217)m=	87.33	86.8	85.84	83.99	81.63	79.8	79.8	79.8	79.8	84.12	86.53	87.46		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	221.8	196.71	208.93	191.48	193.14	176.6	169.67	186.09	185.73	198.26	203.71	216.15		
Total = Sum(219a)$_{1...12}$ =													2348.27	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2474.21	
Water heating fuel used			2348.27	
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			327.85	(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	=	534.43	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	507.23	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1041.66	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	170.15	(268)

TER WorkSheet: New dwelling design stage

Total CO2, kg/year	sum of (265)…(271) =	1250.73	(272)
TER =		24.38	(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 17:36:08

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.1m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 105

Address : GT 105, 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)	24.5 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	6.49 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	35.1 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	0.10 (max. 0.25)	0.10 (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):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	2.24m²
Windows facing: North	1.5m²
Windows facing: North	6.73m²
Windows facing: North	2.24m²
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	0.1 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: GT 105

Address : GT 105, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.1	(1a) x	2.6	(2a) =	187.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	187.46	(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

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			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(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)
Floor			72.1	x 0.1	=	7.21			(28)
Walls	33.8	12.71	21.09	x 0.12	=	2.53			(29)
Total area of elements, m²			105.9						(31)
Party wall			54.21	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) = 26.59 (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 5.5 (36)

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

Total fabric heat loss (33) + (36) = 32.09 (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=	13.97	13.84	13.71	13.05	12.92	12.26	12.26	12.13	12.53	12.92	13.18	13.45	(38)

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

(39)m=	46.06	45.93	45.8	45.14	45.01	44.35	44.35	44.22	44.62	45.01	45.27	45.54	

Average = Sum(39)$_{1…12}$ /12= 45.11 (39)

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

(40)m=	0.64	0.64	0.64	0.63	0.62	0.62	0.62	0.61	0.62	0.62	0.63	0.63

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 2.3 (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 88.73 (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=	97.6	94.05	90.5	86.96	83.41	79.86	79.86	83.41	86.96	90.5	94.05	97.6	
										Total = Sum(44)$_{1...12}$ =		1064.76	(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=	144.74	126.59	130.63	113.89	109.28	94.3	87.38	100.27	101.47	118.25	129.08	140.18	
										Total = Sum(45)$_{1...12}$ =		1396.07	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	21.71	18.99	19.59	17.08	16.39	14.14	13.11	15.04	15.22	17.74	19.36	21.03	(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=	200.02	176.52	185.91	167.38	164.56	147.79	142.66	155.55	154.96	173.53	182.58	195.45	(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=	200.02	176.52	185.91	167.38	164.56	147.79	142.66	155.55	154.96	173.53	182.58	195.45	

Output from water heater (annual)$_{1...12}$ 2046.91 (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=	92.35	82.03	87.66	80.66	80.56	74.15	73.28	77.56	76.53	83.54	85.72	90.83	(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=	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	(66)

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

(67)m=	18.14	16.11	13.1	9.92	7.41	6.26	6.76	8.79	11.8	14.98	17.48	18.64	(67)

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

(68)m=	202.15	204.25	198.96	187.71	173.5	160.15	151.23	149.13	154.42	165.67	179.88	193.23	(68)

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

(69)m=	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	(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=	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	(71)

Water heating gains (Table 5)

(72)m=	124.12	122.07	117.82	112.03	108.28	102.99	98.49	104.25	106.3	112.29	119.05	122.08	(72)

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

(73)m=	401.85	399.87	387.32	367.1	346.63	326.83	313.92	319.61	329.95	350.38	373.85	391.39	(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	1.5	x	10.63	x	0.4	x	0.8	=	3.54	(74)
North	0.9x	0.77	x	6.73	x	10.63	x	0.4	x	0.8	=	15.87	(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	1.5	x	20.32	x	0.4	x	0.8	=	6.76	(74)
North	0.9x	0.77	x	6.73	x	20.32	x	0.4	x	0.8	=	30.33	(74)

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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	1.5	x	34.53	x	0.4	x	0.8	=	11.49	(74)
North	0.9x	0.77	x	6.73	x	34.53	x	0.4	x	0.8	=	51.53	(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	1.5	x	55.46	x	0.4	x	0.8	=	18.45	(74)
North	0.9x	0.77	x	6.73	x	55.46	x	0.4	x	0.8	=	82.78	(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	1.5	x	74.72	x	0.4	x	0.8	=	24.85	(74)
North	0.9x	0.77	x	6.73	x	74.72	x	0.4	x	0.8	=	111.51	(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	1.5	x	79.99	x	0.4	x	0.8	=	26.61	(74)
North	0.9x	0.77	x	6.73	x	79.99	x	0.4	x	0.8	=	119.37	(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	1.5	x	74.68	x	0.4	x	0.8	=	24.84	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.4	x	0.8	=	111.45	(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	1.5	x	59.25	x	0.4	x	0.8	=	19.71	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.4	x	0.8	=	88.42	(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	1.5	x	41.52	x	0.4	x	0.8	=	13.81	(74)
North	0.9x	0.77	x	6.73	x	41.52	x	0.4	x	0.8	=	61.96	(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	1.5	x	24.19	x	0.4	x	0.8	=	8.05	(74)
North	0.9x	0.77	x	6.73	x	24.19	x	0.4	x	0.8	=	36.1	(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	1.5	x	13.12	x	0.4	x	0.8	=	4.36	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.4	x	0.8	=	19.58	(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	1.5	x	8.86	x	0.4	x	0.8	=	2.95	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.4	x	0.8	=	13.23	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(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	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(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	2.24	x	110.23	x	0.4	x	0.8	=	54.76	(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	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(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	2.24	x	104.89	x	0.4	x	0.8	=	52.11	(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	2.24	x	82.59	x	0.4	x	0.8	=	41.02	(78)

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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	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)

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

(83)m=	47.91	85.22	128.62	183.54	230.54	240.63	227.04	189.67	147.01	97.19	57.98	40.65	(83)

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

(84)m=	449.76	485.08	515.94	550.63	577.17	567.46	540.96	509.28	476.96	447.57	431.84	432.04	(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	0.89	0.71	0.5	0.36	0.4	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=	20.54	20.63	20.76	20.92	20.99	21	21	21	21	20.91	20.71	20.52	(87)

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

(88)m=	20.4	20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.41	20.41	20.4	20.4	(88)

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

(89)m=	0.99	0.99	0.96	0.87	0.67	0.45	0.31	0.35	0.59	0.89	0.98	1	(89)

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

(90)m=	19.78	19.91	20.1	20.32	20.4	20.42	20.42	20.42	20.41	20.31	20.03	19.75	(90)

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

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

(92)m=	20.06	20.17	20.35	20.54	20.62	20.63	20.63	20.63	20.63	20.54	20.28	20.04	(92)

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

(93)m=	20.06	20.17	20.35	20.54	20.62	20.63	20.63	20.63	20.63	20.54	20.28	20.04	(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	0.87	0.69	0.47	0.33	0.37	0.61	0.89	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	446.41	477.75	495.54	479.84	395.37	267.28	178.81	187.16	289.45	399.88	423.47	429.59	(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=	725.81	701.46	634.18	525.41	401.31	267.51	178.82	187.18	291.19	447.23	596.68	721.11	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	207.87	150.33	103.15	32.81	4.42	0	0	0	0	35.23	124.71	216.89	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = | 875.4 | (98)

Space heating requirement in kWh/m²/year | 12.14 | (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		875.4	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	962.94	(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		2046.91	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2251.6	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.15	(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		151.51	(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) =	151.51	(331)
Energy for lighting (calculated in Appendix L)		320.27	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-610.58	(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	=	522.99	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.68	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	539.68	(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) =			539.68	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	78.64	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	166.22	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-316.89	(380)
Total CO2, kg/year	sum of (376)…(382) =			467.64	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			6.49	(384)
EI rating (section 14)				94.65	(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: GT 105

Address : GT 105, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.1	(1a) x	2.6	(2a) =	187.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.1	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		187.46	(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							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		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.35	(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

0.44	0.44	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × 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	0.58	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	0.58	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			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(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)
Floor			72.1	x	0.13	=	9.372999			(28)
Walls	33.8	12.71	21.09	x	0.18	=	3.8			(29)
Total area of elements, m²			105.9							(31)
Party wall			54.21	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) = 30.02 (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 3.82 (36)

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

Total fabric heat loss (33) + (36) = 33.84 (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=	37.04	36.8	36.57	35.48	35.27	34.32	34.32	34.15	34.69	35.27	35.69	36.12	(38)

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

(39)m=	70.88	70.64	70.41	69.32	69.11	68.16	68.16	67.99	68.53	69.11	69.53	69.96	

Average = Sum(39)$_{1…12}$ /12= 69.32 (39)

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

(40)m=	0.98	0.98	0.98	0.96	0.96	0.95	0.95	0.94	0.95	0.96	0.96	0.97

Average = Sum(40)$_{1...12}$ /12= 0.96 (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 2.3 (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 88.73 (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=	97.6	94.05	90.5	86.96	83.41	79.86	79.86	83.41	86.96	90.5	94.05	97.6

Total = Sum(44)$_{1...12}$ = 1064.76 (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=	144.74	126.59	130.63	113.89	109.28	94.3	87.38	100.27	101.47	118.25	129.08	140.18

Total = Sum(45)$_{1...12}$ = 1396.07 (45)

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

(46)m=	21.71	18.99	19.59	17.08	16.39	14.14	13.11	15.04	15.22	17.74	19.36	21.03	(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=	191.34	168.68	177.23	158.98	155.87	139.39	133.98	146.87	146.56	164.85	174.17	186.77	(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=	191.34	168.68	177.23	158.98	155.87	139.39	133.98	146.87	146.56	164.85	174.17	186.77	

Output from water heater (annual)$_{1...12}$ 1944.69 (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=	85.4	75.76	80.71	73.94	73.61	67.43	66.33	70.62	69.81	76.6	78.99	83.88	(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=	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	114.8	(66)

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

(67)m=	18.47	16.4	13.34	10.1	7.55	6.37	6.89	8.95	12.02	15.26	17.81	18.98	(67)

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

(68)m=	202.15	204.25	198.96	187.71	173.5	160.15	151.23	149.13	154.42	165.67	179.88	193.23	(68)

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

(69)m=	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	(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=	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	(71)

Water heating gains (Table 5)

(72)m=	114.79	112.74	108.48	102.7	98.94	93.65	89.15	94.91	96.96	102.95	109.71	112.75	(72)

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

(73)m=	395.85	393.83	381.22	360.94	340.43	320.61	307.71	313.44	323.84	344.32	367.84	385.4	(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	1.5	x	10.63	x	0.63	x	0.7	=	4.87	(74)
North	0.9x	0.77	x	6.73	x	10.63	x	0.63	x	0.7	=	21.87	(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	1.5	x	20.32	x	0.63	x	0.7	=	9.32	(74)
North	0.9x	0.77	x	6.73	x	20.32	x	0.63	x	0.7	=	41.8	(74)

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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	1.5	x	34.53	x	0.63	x	0.7	=	15.83	(74)
North	0.9x	0.77	x	6.73	x	34.53	x	0.63	x	0.7	=	71.02	(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	1.5	x	55.46	x	0.63	x	0.7	=	25.43	(74)
North	0.9x	0.77	x	6.73	x	55.46	x	0.63	x	0.7	=	114.08	(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	1.5	x	74.72	x	0.63	x	0.7	=	34.25	(74)
North	0.9x	0.77	x	6.73	x	74.72	x	0.63	x	0.7	=	153.67	(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	1.5	x	79.99	x	0.63	x	0.7	=	36.67	(74)
North	0.9x	0.77	x	6.73	x	79.99	x	0.63	x	0.7	=	164.51	(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	1.5	x	74.68	x	0.63	x	0.7	=	34.23	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.63	x	0.7	=	153.59	(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	1.5	x	59.25	x	0.63	x	0.7	=	27.16	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.63	x	0.7	=	121.86	(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	1.5	x	41.52	x	0.63	x	0.7	=	19.03	(74)
North	0.9x	0.77	x	6.73	x	41.52	x	0.63	x	0.7	=	85.39	(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	1.5	x	24.19	x	0.63	x	0.7	=	11.09	(74)
North	0.9x	0.77	x	6.73	x	24.19	x	0.63	x	0.7	=	49.75	(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	1.5	x	13.12	x	0.63	x	0.7	=	6.01	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.63	x	0.7	=	26.98	(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	1.5	x	8.86	x	0.63	x	0.7	=	4.06	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.63	x	0.7	=	18.23	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.63	x	0.7	=	6.07	(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	2.24	x	76.57	x	0.63	x	0.7	=	52.42	(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	2.24	x	110.23	x	0.63	x	0.7	=	75.46	(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	2.24	x	110.55	x	0.63	x	0.7	=	75.68	(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	2.24	x	104.89	x	0.63	x	0.7	=	71.81	(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	2.24	x	82.59	x	0.63	x	0.7	=	56.54	(78)

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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	2.24	x	40.4	x	0.63	x	0.7	=	27.66	(78)

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

(83)m=	66.03	117.44	177.26	252.94	317.71	331.61	312.89	261.38	202.59	133.94	79.91	56.02	(83)

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

(84)m=	461.88	511.27	558.48	613.88	658.14	652.23	620.6	574.82	526.43	478.26	447.75	441.42	(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=	1	0.99	0.99	0.95	0.84	0.65	0.48	0.54	0.8	0.97	0.99	1	(86)

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

(87)m=	20.03	20.15	20.37	20.66	20.88	20.98	21	20.99	20.93	20.65	20.3	20.01	(87)

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

(88)m=	20.1	20.1	20.1	20.12	20.12	20.13	20.13	20.13	20.12	20.12	20.11	20.11	(88)

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

(89)m=	1	0.99	0.98	0.93	0.8	0.57	0.39	0.44	0.73	0.95	0.99	1	(89)

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

(90)m=	18.8	18.99	19.29	19.71	20	20.12	20.13	20.13	20.07	19.72	19.2	18.78	(90)

fLA = Living area ÷ (4) = 0.37 (91)

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

(92)m=	19.25	19.42	19.69	20.06	20.33	20.44	20.45	20.45	20.39	20.06	19.61	19.23	(92)

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

(93)m=	19.25	19.42	19.69	20.06	20.33	20.44	20.45	20.45	20.39	20.06	19.61	19.23	(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=	1	0.99	0.98	0.93	0.81	0.6	0.42	0.48	0.76	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	459.6	506.46	546.07	572.24	532	389.06	261.39	273.37	398.72	454.76	443.08	439.71	(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=	1059.87	1025.49	928.75	773.59	596.29	397.74	262.33	275.23	431.07	654.03	869.56	1051.81	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	446.6	348.79	284.71	144.97	47.83	0	0	0	0	148.26	307.06	455.41	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 2183.63 (98)

Space heating requirement in kWh/m²/year 30.29 (99)

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

Space heating:

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

TER WorkSheet: New dwelling design stage

Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		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)	446.6	348.79	284.71	144.97	47.83	0	0	0	0	148.26	307.06	455.41		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	477.65	373.04	304.51	155.05	51.15	0	0	0	0	158.57	328.41	487.07		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2335.44	(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)	191.34	168.68	177.23	158.98	155.87	139.39	133.98	146.87	146.56	164.85	174.17	186.77		
Efficiency of water heater													79.8	(216)
(217)m=	87	86.71	86.07	84.57	82.08	79.8	79.8	79.8	79.8	84.53	86.31	87.1		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	219.93	194.53	205.91	187.99	189.91	174.68	167.89	184.04	183.66	195.01	201.8	214.42		
Total = Sum(219a)$_{1...12}$ =													2319.77	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2335.44	
Water heating fuel used			2319.77	
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			326.18	(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	=	504.45	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	501.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1005.52	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	169.29	(268)

TER WorkSheet: New dwelling design stage

Total CO_2, kg/year	sum of (265)…(271) =	1213.74	(272)
TER =		24.5	(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 17:36:17

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 73.5m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 106

Address : GT 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)	22.25 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	6.08 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	36.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	32.4 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: South	4.47m²	
Windows facing: North	2.24m²	
Windows facing: North	9.25m²	
Windows facing: South	2.24m²	
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
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: GT 106

Address : GT 106, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73.5	(1a) x	2.6	(2a) =	191.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73.5	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		191.1	(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			4.47	x1/[1/(1.4)+ 0.04] =	5.93			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 3			9.25	x1/[1/(1.4)+ 0.04] =	12.26			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Walls	46.28	18.2	28.08	x 0.12 =	3.37			(29)
Total area of elements, m²			46.28					(31)
Party wall			42.85	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) = 27.5 (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 6.97 (36)

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

Total fabric heat loss (33) + (36) = 34.47 (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=	14.24	14.11	13.98	13.31	13.17	12.5	12.5	12.37	12.77	13.17	13.44	13.71	(38)

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

(39)m=	48.71	48.58	48.45	47.78	47.64	46.97	46.97	46.84	47.24	47.64	47.91	48.18	

Average = Sum(39)$_{1…12}$ /12= 47.74 (39)

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

(40)m=	0.66	0.66	0.66	0.65	0.65	0.64	0.64	0.64	0.64	0.65	0.65	0.66

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 2.33 (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 89.49 (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=	98.44	94.86	91.28	87.7	84.12	80.54	80.54	84.12	87.7	91.28	94.86	98.44	
											Total = Sum(44)$_{1…12}$ =	1073.88	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)													
(45)m=	145.98	127.68	131.75	114.86	110.22	95.11	88.13	101.13	102.34	119.27	130.19	141.38	
											Total = Sum(45)$_{1…12}$ =	1408.03	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	21.9	19.15	19.76	17.23	16.53	14.27	13.22	15.17	15.35	17.89	19.53	21.21	(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)

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=	201.26	177.6	187.03	168.36	165.49	148.6	143.41	156.41	155.83	174.54	183.68	196.65	(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=	201.26	177.6	187.03	168.36	165.49	148.6	143.41	156.41	155.83	174.54	183.68	196.65	

Output from water heater (annual)$_{1...12}$ 2058.87 (64)

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

(65)m=	92.76	82.39	88.03	80.99	80.87	74.42	73.52	77.85	76.82	83.88	86.08	91.23	(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=	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18.3	16.26	13.22	10.01	7.48	6.32	6.83	8.87	11.91	15.12	17.65	18.81	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	205.32	207.45	202.09	190.66	176.23	162.67	153.61	151.48	156.85	168.28	182.7	196.26	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	(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=	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	(71)
Water heating gains (Table 5)													
(72)m=	124.68	122.61	118.32	112.48	108.69	103.36	98.82	104.63	106.7	112.74	119.56	122.62	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	406.23	404.24	391.55	371.07	350.32	330.26	317.18	322.9	333.37	354.05	377.83	395.62	(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	9.25	x	10.63	x	0.4	x	0.8	=	21.81	(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	9.25	x	20.32	x	0.4	x	0.8	=	41.68	(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	9.25	x	34.53	x	0.4	x	0.8	=	70.83	(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	9.25	x	55.46	x	0.4	x	0.8	=	113.77	(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	9.25	x	74.72	x	0.4	x	0.8	=	153.26	(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	9.25	x	79.99	x	0.4	x	0.8	=	164.07	(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	9.25	x	74.68	x	0.4	x	0.8	=	153.18	(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	9.25	x	59.25	x	0.4	x	0.8	=	121.53	(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	9.25	x	41.52	x	0.4	x	0.8	=	85.16	(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	9.25	x	24.19	x	0.4	x	0.8	=	49.62	(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	9.25	x	13.12	x	0.4	x	0.8	=	26.91	(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	9.25	x	8.86	x	0.4	x	0.8	=	18.18	(74)
South	0.9x	0.77	x	4.47	x	46.75	x	0.4	x	0.8	=	46.34	(78)
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	4.47	x	76.57	x	0.4	x	0.8	=	75.9	(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	4.47	x	97.53	x	0.4	x	0.8	=	96.68	(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	4.47	x	110.23	x	0.4	x	0.8	=	109.27	(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	4.47	x	114.87	x	0.4	x	0.8	=	113.87	(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	4.47	x	110.55	x	0.4	x	0.8	=	109.58	(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	4.47	x	108.01	x	0.4	x	0.8	=	107.07	(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	4.47	x	104.89	x	0.4	x	0.8	=	103.98	(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	4.47	x	101.89	x	0.4	x	0.8	=	101	(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	4.47	x	82.59	x	0.4	x	0.8	=	81.86	(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	4.47	x	55.42	x	0.4	x	0.8	=	54.93	(78)
South	0.9x	0.77	x	2.24	x	55.42	x	0.4	x	0.8	=	27.53	(78)

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South	0.9x	0.77	x	4.47	x	40.4	x	0.4	x	0.8	=	40.05	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)

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

(83)m=	96.66	165.71	233.12	305.35	361.31	368.3	351	307.05	257.39	184.52	115.89	82.7	(83)

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

(84)m=	502.89	569.96	624.66	676.42	711.63	698.56	668.18	629.95	590.76	538.58	493.72	478.32	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.93	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=	20.56	20.68	20.83	20.96	20.99	21	21	21	21	20.95	20.74	20.53	(87)

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

(88)m=	20.37	20.38	20.38	20.39	20.39	20.39	20.39	20.4	20.39	20.39	20.38	20.38	(88)

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

(89)m=	0.99	0.97	0.92	0.78	0.58	0.39	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=	19.79	19.97	20.18	20.34	20.38	20.39	20.39	20.4	20.39	20.33	20.06	19.75	(90)

fLA = Living area ÷ (4) = | 0.33 | (91)

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

(92)m=	20.04	20.2	20.39	20.54	20.58	20.59	20.59	20.59	20.59	20.53	20.28	20.01	(92)

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

(93)m=	20.04	20.2	20.39	20.54	20.58	20.59	20.59	20.59	20.59	20.53	20.28	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	0.97	0.92	0.79	0.59	0.4	0.28	0.31	0.52	0.83	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	496.79	552.51	574.26	531.97	420.71	281.42	187.57	196.45	305.9	444.38	477.31	474.07	(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=	766.78	743.42	672.96	556.2	423.22	281.51	187.58	196.46	306.58	473.27	631.53	761.62	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	200.87	128.29	73.43	17.45	1.87	0	0	0	0	21.5	111.04	213.93	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = | 768.39 | (98)

Space heating requirement in kWh/m²/year | 10.45 | (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		768.39	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	845.23	(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		2058.87	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2264.76	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	31.1	(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		154.46	(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) =	154.46	(331)
Energy for lighting (calculated in Appendix L)		323.27	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-622.67	(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	=	505.98	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.14	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	522.12	(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) =			522.12	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	80.16	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	167.78	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-323.17	(380)
Total CO2, kg/year	sum of (376)…(382) =			446.9	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			6.08	(384)
EI rating (section 14)				94.95	(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: GT 106

Address : GT 106, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73.5	(1a) x	2.6	(2a) =	191.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73.5	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	191.1	(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		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.35	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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	0.35	0.37	0.39	0.41

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × 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	0.58	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	0.58	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			4.47	x1/[1/(1.4)+ 0.04] =	5.93			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 3			9.25	x1/[1/(1.4)+ 0.04] =	12.26			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Walls	46.28	18.2	28.08	x 0.18 =	5.05			(29)
Total area of elements, m²			46.28					(31)
Party wall			42.85	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) = 29.18 (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 4.77 (36)

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

Total fabric heat loss (33) + (36) = 33.96 (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=	37.67	37.43	37.19	36.1	35.89	34.94	34.94	34.76	35.3	35.89	36.31	36.74	(38)

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

(39)m=	71.62	71.39	71.15	70.06	69.85	68.9	68.9	68.72	69.26	69.85	70.27	70.7	

Average = Sum(39)$_{1\ldots12}$ /12= 70.05 (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	0.93	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 2.33 (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 89.49 (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=	98.44	94.86	91.28	87.7	84.12	80.54	80.54	84.12	87.7	91.28	94.86	98.44

Total = Sum(44)$_{1…12}$ = 1073.88 (44)

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

(45)m=	145.98	127.68	131.75	114.86	110.22	95.11	88.13	101.13	102.34	119.27	130.19	141.38

Total = Sum(45)$_{1…12}$ = 1408.03 (45)

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

(46)m=	21.9	19.15	19.76	17.23	16.53	14.27	13.22	15.17	15.35	17.89	19.53	21.21	(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)

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=	192.58	169.76	178.35	159.96	156.81	140.2	134.73	147.73	147.43	165.86	175.28	187.97	(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=	192.58	169.76	178.35	159.96	156.81	140.2	134.73	147.73	147.43	165.86	175.28	187.97	

Output from water heater (annual)$_{1...12}$ 1956.65 (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=	85.82	76.12	81.08	74.27	73.92	67.7	66.58	70.9	70.1	76.93	79.36	84.28	(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=	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	(66)

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

(67)m=	18.3	16.26	13.22	10.01	7.48	6.32	6.83	8.87	11.91	15.12	17.65	18.81	(67)

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

(68)m=	205.32	207.45	202.09	190.66	176.23	162.67	153.61	151.48	156.85	168.28	182.7	196.26	(68)

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

(69)m=	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	(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=	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	(71)

Water heating gains (Table 5)

(72)m=	115.34	113.28	108.98	103.15	99.36	94.02	89.49	95.3	97.36	103.4	110.22	113.28	(72)

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

(73)m=	399.89	397.91	385.21	364.73	343.99	323.93	310.84	316.57	327.04	347.72	371.5	389.28	(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	2.24	x	10.63	x	0.63	x	0.7	=	7.28	(74)
North	0.9x	0.77	x	9.25	x	10.63	x	0.63	x	0.7	=	30.06	(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	9.25	x	20.32	x	0.63	x	0.7	=	57.45	(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	9.25	x	34.53	x	0.63	x	0.7	=	97.61	(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	9.25	x	55.46	x	0.63	x	0.7	=	156.79	(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	9.25	x	74.72	x	0.63	x	0.7	=	211.22	(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	9.25	x	79.99	x	0.63	x	0.7	=	226.11	(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	9.25	x	74.68	x	0.63	x	0.7	=	211.1	(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	9.25	x	59.25	x	0.63	x	0.7	=	167.48	(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	9.25	x	41.52	x	0.63	x	0.7	=	117.36	(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	9.25	x	24.19	x	0.63	x	0.7	=	68.38	(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	9.25	x	13.12	x	0.63	x	0.7	=	37.08	(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	9.25	x	8.86	x	0.63	x	0.7	=	25.06	(74)
South	0.9x	0.77	x	4.47	x	46.75	x	0.63	x	0.7	=	63.87	(78)
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	4.47	x	76.57	x	0.63	x	0.7	=	104.6	(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	4.47	x	97.53	x	0.63	x	0.7	=	133.24	(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	4.47	x	110.23	x	0.63	x	0.7	=	150.59	(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	4.47	x	114.87	x	0.63	x	0.7	=	156.92	(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	4.47	x	110.55	x	0.63	x	0.7	=	151.02	(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	4.47	x	108.01	x	0.63	x	0.7	=	147.55	(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	4.47	x	104.89	x	0.63	x	0.7	=	143.3	(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	4.47	x	101.89	x	0.63	x	0.7	=	139.18	(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	4.47	x	82.59	x	0.63	x	0.7	=	112.82	(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	4.47	x	55.42	x	0.63	x	0.7	=	75.7	(78)
South	0.9x	0.77	x	2.24	x	55.42	x	0.63	x	0.7	=	37.94	(78)

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South	0.9x	0.77	x	4.47	x	40.4	x	0.63	x	0.7	=	55.19	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.63	x	0.7	=	27.66	(78)

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

(83)m=	133.21	228.37	321.26	420.82	497.93	507.56	483.72	423.15	354.72	254.3	159.7	113.97	(83)

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

(84)m=	533.1	626.28	706.47	785.55	841.91	831.49	794.56	739.71	681.76	602.02	531.2	503.25	(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	0.73	0.52	0.38	0.43	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	20.3	20.53	20.8	20.95	20.99	21	21	20.97	20.77	20.4	20.09	(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	20.14	20.14	20.14	20.13	20.12	20.12	20.12	(88)

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

(89)m=	0.99	0.98	0.95	0.85	0.67	0.46	0.31	0.35	0.6	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=	18.94	19.2	19.54	19.9	20.08	20.13	20.14	20.14	20.11	19.88	19.36	18.9	(90)

fLA = Living area ÷ (4) = 0.33 (91)

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

(92)m=	19.33	19.56	19.86	20.19	20.36	20.41	20.42	20.42	20.4	20.17	19.7	19.29	(92)

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

(93)m=	19.33	19.56	19.86	20.19	20.36	20.41	20.42	20.42	20.4	20.17	19.7	19.29	(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	0.86	0.69	0.48	0.33	0.37	0.62	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	528.33	612.83	668.87	673.38	577.87	397.86	262.84	275.73	424.35	538.95	520.12	499.87	(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=	1076.29	1046.35	950.8	791.2	605.19	400.59	263.09	276.22	436.08	668.53	885.3	1067.14	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	407.68	291.33	209.76	84.83	20.32	0	0	0	0	96.41	262.93	422.05	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1795.32 (98)

Space heating requirement in kWh/m²/year 24.43 (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)	407.68	291.33	209.76	84.83	20.32	0	0	0	0	96.41	262.93	422.05		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	436.02	311.58	224.34	90.73	21.74	0	0	0	0	103.11	281.21	451.39		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1920.12	(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)	192.58	169.76	178.35	159.96	156.81	140.2	134.73	147.73	147.43	165.86	175.28	187.97		
Efficiency of water heater													79.8	(216)
(217)m=	86.77	86.24	85.25	83.21	80.9	79.8	79.8	79.8	79.8	83.43	85.89	86.91		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	221.95	196.84	209.21	192.23	193.84	175.69	168.83	185.12	184.75	198.81	204.07	216.28		
Total = Sum(219a)$_{1...12}$ =													2347.63	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1920.12	
Water heating fuel used			2347.63	
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			323.27	(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	=	414.75	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	507.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				921.83	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	167.78	(268)

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Total CO_2, kg/year	sum of (265)…(271) =	1128.54	(272)
TER =		22.25	(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 17:36:26

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 50m²	
Site Reference :	Maitland Park Estate	**Plot Reference:**	GT 107
Address :	GT 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)	26.66 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	8.52 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.9 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: North	2.24m²	
Windows facing: North	2.24m²	
Windows facing: North	9.25m²	
Windows facing: North	2.24m²	
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
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: GT 107

Address : GT 107, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	50	(1a) x	2.6	(2a) =	130	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	50	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	130	(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		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(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

0.1	0.1	0.09	0.09	0.08	0.07	0.07	0.07	0.08	0.08	0.09	0.09

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=	0.22	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.2	0.2	0.2	0.21	(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=	0.22	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.2	0.2	0.2	0.21	(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			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 3			9.25	x1/[1/(1.4)+ 0.04]	=	12.26			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Walls	32.58	15.97	16.61	x 0.12	=	1.99			(29)
Total area of elements, m²			32.58						(31)
Party wall			57.02	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) = 23.17 (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 5.46 (36)

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

Total fabric heat loss (33) + (36) = 28.63 (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=	9.28	9.2	9.11	8.7	8.61	8.2	8.2	8.12	8.37	8.61	8.78	8.95	(38)

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

(39)m=	37.91	37.82	37.74	37.33	37.24	36.83	36.83	36.74	36.99	37.24	37.41	37.58	

Average = Sum(39)$_{1…12}$ /12= 37.31 (39)

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

(40)m=	0.76	0.76	0.75	0.75	0.74	0.74	0.74	0.73	0.74	0.74	0.75	0.75

Average = Sum(40)$_{1...12}$ /12= 0.75 (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 — 1.69 (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 — 74.34 (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=	81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77

Total = Sum(44)$_{1...12}$ = 892.08 (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=	121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44

Total = Sum(45)$_{1...12}$ = 1169.66 (45)

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

(46)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62	(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=	176.55	155.99	164.72	148.91	146.83	132.5	128.49	139.29	138.51	154.35	161.64	172.72	(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=	176.55	155.99	164.72	148.91	146.83	132.5	128.49	139.29	138.51	154.35	161.64	172.72	

Output from water heater (annual)$_{1...12}$ 1820.5 (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=	84.54	75.21	80.61	74.52	74.66	69.06	68.56	72.15	71.06	77.16	78.75	83.27	(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=	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	(66)

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

(67)m=	13.13	11.66	9.48	7.18	5.37	4.53	4.89	6.36	8.54	10.84	12.66	13.49	(67)

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

(68)m=	147.23	148.76	144.91	136.72	126.37	116.64	110.15	108.62	112.47	120.67	131.01	140.74	(68)

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

(69)m=	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	(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=	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	(71)

Water heating gains (Table 5)

(72)m=	113.63	111.92	108.35	103.5	100.35	95.92	92.16	96.98	98.7	103.71	109.38	111.92	(72)

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

(73)m=	322.34	320.69	311.09	295.75	280.44	265.45	255.55	260.32	268.06	283.58	301.4	314.5	(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	2.24	x	10.63	x	0.4	x	0.8	=	5.28	(74)
North	0.9x	0.77	x	9.25	x	10.63	x	0.4	x	0.8	=	21.81	(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	2.24	x	20.32	x	0.4	x	0.8	=	10.09	(74)

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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	9.25	x	20.32	x	0.4	x	0.8	=	41.68	(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	2.24	x	34.53	x	0.4	x	0.8	=	17.15	(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	9.25	x	34.53	x	0.4	x	0.8	=	70.83	(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	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(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	9.25	x	55.46	x	0.4	x	0.8	=	113.77	(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	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(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	9.25	x	74.72	x	0.4	x	0.8	=	153.26	(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	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(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	9.25	x	79.99	x	0.4	x	0.8	=	164.07	(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	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(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	9.25	x	74.68	x	0.4	x	0.8	=	153.18	(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	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(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	9.25	x	59.25	x	0.4	x	0.8	=	121.53	(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	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(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	9.25	x	41.52	x	0.4	x	0.8	=	85.16	(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	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(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	9.25	x	24.19	x	0.4	x	0.8	=	49.62	(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	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(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	9.25	x	13.12	x	0.4	x	0.8	=	26.91	(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	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)

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North	0.9x	0.77	x	9.25	x	8.86	x	0.4	x	0.8	=	18.18	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)

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

(83)m=	37.66	71.97	122.29	196.43	264.61	283.27	264.47	209.82	147.03	85.67	46.46	31.39	(83)

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

(84)m=	360	392.65	433.38	492.17	545.05	548.72	520.02	470.14	415.09	369.24	347.86	345.9	(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	0.84	0.63	0.43	0.31	0.36	0.61	0.9	0.98	0.99	(86)

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

(87)m=	20.44	20.55	20.73	20.92	20.99	21	21	21	20.99	20.89	20.64	20.42	(87)

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

(88)m=	20.29	20.29	20.29	20.3	20.3	20.31	20.31	20.31	20.31	20.3	20.3	20.3	(88)

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

(89)m=	0.99	0.98	0.94	0.81	0.58	0.38	0.26	0.31	0.55	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=	19.55	19.71	19.96	20.21	20.29	20.31	20.31	20.31	20.3	20.18	19.84	19.52	(90)

fLA = Living area ÷ (4) = 0.5 (91)

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

(92)m=	20	20.13	20.35	20.57	20.64	20.66	20.66	20.66	20.65	20.54	20.24	19.97	(92)

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

(93)m=	20	20.13	20.35	20.57	20.64	20.66	20.66	20.66	20.65	20.54	20.24	19.97	(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	0.6	0.41	0.29	0.33	0.58	0.88	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	355.94	384.11	408.48	402.71	329.28	222.81	149.35	156.36	240.23	324.64	338.86	342.81	(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=	595.06	576.04	522.55	435.53	333.06	223	149.36	156.4	242.28	370.02	491.56	592.58	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	177.91	128.98	84.87	23.63	2.81	0	0	0	0	33.76	109.95	185.83	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 747.73 (98)

Space heating requirement in kWh/m²/year 14.95 (99)

9b. Energy requirements – Community heating scheme

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

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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		747.73	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	822.51	(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		1820.5	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2002.55	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	28.25	(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		99.12	(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) =	99.12	(331)
Energy for lighting (calculated in Appendix L)		231.81	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-424.04	(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	=	459.62	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	14.66	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	474.29	(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) =			474.29	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	51.45	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	120.31	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-220.08	(380)
Total CO2, kg/year	sum of (376)…(382) =			425.97	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			8.52	(384)
EI rating (section 14)				93.99	(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: GT 107

Address : GT 107, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	50	(1a) x	2.6	(2a) =	130	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	50	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	130	(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		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(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	0.34	0.3	0.3	0.29	0.31	0.34	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			1.75	x1/[1/(1.4)+ 0.04]	=	2.32			(27)
Windows Type 2			1.75	x1/[1/(1.4)+ 0.04]	=	2.32			(27)
Windows Type 3			7.24	x1/[1/(1.4)+ 0.04]	=	9.6			(27)
Windows Type 4			1.75	x1/[1/(1.4)+ 0.04]	=	2.32			(27)
Walls	32.58	12.49	20.09	x 0.18	=	3.62			(29)
Total area of elements, m²			32.58						(31)
Party wall			57.02	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) = 20.17 (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 3.59 (36)

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

Total fabric heat loss (33) + (36) = 23.76 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	24.87	24.73	24.6	23.99	23.88	23.35	23.35	23.25	23.55	23.88	24.11	24.35	(38)

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

(39)m=	48.63	48.5	48.37	47.76	47.64	47.11	47.11	47.01	47.32	47.64	47.87	48.12	

Average = Sum(39)$_{1…12}$ /12= 47.76 (39)

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

(40)m=	0.97	0.97	0.97	0.96	0.95	0.94	0.94	0.94	0.95	0.95	0.96	0.96

Average = Sum(40)$_{1...12}$ /12= 0.96 (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 1.69 (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 74.34 (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=	81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77

Total = Sum(44)$_{1...12}$ = 892.08 (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=	121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44

Total = Sum(45)$_{1...12}$ = 1169.66 (45)

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

(46)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62	(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=	167.86	148.15	156.04	140.51	138.15	124.1	119.81	130.61	130.11	145.67	153.24	164.04	(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=	167.86	148.15	156.04	140.51	138.15	124.1	119.81	130.61	130.11	145.67	153.24	164.04	

Output from water heater (annual)$_{1...12}$ 1718.27 (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=	77.6	68.93	73.67	67.8	67.72	62.34	61.62	65.21	64.34	70.22	72.03	76.33	(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=	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	(66)

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

(67)m=	13.13	11.66	9.48	7.18	5.37	4.53	4.89	6.36	8.54	10.84	12.66	13.49	(67)

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

(68)m=	147.23	148.76	144.91	136.72	126.37	116.64	110.15	108.62	112.47	120.67	131.01	140.74	(68)

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

(69)m=	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	(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=	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	(71)

Water heating gains (Table 5)

(72)m=	104.3	102.58	99.01	94.17	91.02	86.59	82.82	87.65	89.36	94.38	100.05	102.59	(72)

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

(73)m=	316.01	314.35	304.76	289.41	274.11	259.11	249.22	253.98	261.72	277.24	295.07	308.17	(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	1.75	x	10.63	x	0.63	x	0.7	=	5.69	(74)
North	0.9x	0.77	x	1.75	x	10.63	x	0.63	x	0.7	=	5.69	(74)
North	0.9x	0.77	x	7.24	x	10.63	x	0.63	x	0.7	=	23.53	(74)
North	0.9x	0.77	x	1.75	x	10.63	x	0.63	x	0.7	=	5.69	(74)
North	0.9x	0.77	x	1.75	x	20.32	x	0.63	x	0.7	=	10.87	(74)

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North	0.9x	0.77	x	1.75	x	20.32	x	0.63	x	0.7	=	10.87	(74)
North	0.9x	0.77	x	7.24	x	20.32	x	0.63	x	0.7	=	44.96	(74)
North	0.9x	0.77	x	1.75	x	20.32	x	0.63	x	0.7	=	10.87	(74)
North	0.9x	0.77	x	1.75	x	34.53	x	0.63	x	0.7	=	18.47	(74)
North	0.9x	0.77	x	1.75	x	34.53	x	0.63	x	0.7	=	18.47	(74)
North	0.9x	0.77	x	7.24	x	34.53	x	0.63	x	0.7	=	76.4	(74)
North	0.9x	0.77	x	1.75	x	34.53	x	0.63	x	0.7	=	18.47	(74)
North	0.9x	0.77	x	1.75	x	55.46	x	0.63	x	0.7	=	29.66	(74)
North	0.9x	0.77	x	1.75	x	55.46	x	0.63	x	0.7	=	29.66	(74)
North	0.9x	0.77	x	7.24	x	55.46	x	0.63	x	0.7	=	122.72	(74)
North	0.9x	0.77	x	1.75	x	55.46	x	0.63	x	0.7	=	29.66	(74)
North	0.9x	0.77	x	1.75	x	74.72	x	0.63	x	0.7	=	39.96	(74)
North	0.9x	0.77	x	1.75	x	74.72	x	0.63	x	0.7	=	39.96	(74)
North	0.9x	0.77	x	7.24	x	74.72	x	0.63	x	0.7	=	165.32	(74)
North	0.9x	0.77	x	1.75	x	74.72	x	0.63	x	0.7	=	39.96	(74)
North	0.9x	0.77	x	1.75	x	79.99	x	0.63	x	0.7	=	42.78	(74)
North	0.9x	0.77	x	1.75	x	79.99	x	0.63	x	0.7	=	42.78	(74)
North	0.9x	0.77	x	7.24	x	79.99	x	0.63	x	0.7	=	176.98	(74)
North	0.9x	0.77	x	1.75	x	79.99	x	0.63	x	0.7	=	42.78	(74)
North	0.9x	0.77	x	1.75	x	74.68	x	0.63	x	0.7	=	39.94	(74)
North	0.9x	0.77	x	1.75	x	74.68	x	0.63	x	0.7	=	39.94	(74)
North	0.9x	0.77	x	7.24	x	74.68	x	0.63	x	0.7	=	165.23	(74)
North	0.9x	0.77	x	1.75	x	74.68	x	0.63	x	0.7	=	39.94	(74)
North	0.9x	0.77	x	1.75	x	59.25	x	0.63	x	0.7	=	31.69	(74)
North	0.9x	0.77	x	1.75	x	59.25	x	0.63	x	0.7	=	31.69	(74)
North	0.9x	0.77	x	7.24	x	59.25	x	0.63	x	0.7	=	131.09	(74)
North	0.9x	0.77	x	1.75	x	59.25	x	0.63	x	0.7	=	31.69	(74)
North	0.9x	0.77	x	1.75	x	41.52	x	0.63	x	0.7	=	22.2	(74)
North	0.9x	0.77	x	1.75	x	41.52	x	0.63	x	0.7	=	22.2	(74)
North	0.9x	0.77	x	7.24	x	41.52	x	0.63	x	0.7	=	91.86	(74)
North	0.9x	0.77	x	1.75	x	41.52	x	0.63	x	0.7	=	22.2	(74)
North	0.9x	0.77	x	1.75	x	24.19	x	0.63	x	0.7	=	12.94	(74)
North	0.9x	0.77	x	1.75	x	24.19	x	0.63	x	0.7	=	12.94	(74)
North	0.9x	0.77	x	7.24	x	24.19	x	0.63	x	0.7	=	53.52	(74)
North	0.9x	0.77	x	1.75	x	24.19	x	0.63	x	0.7	=	12.94	(74)
North	0.9x	0.77	x	1.75	x	13.12	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	1.75	x	13.12	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	7.24	x	13.12	x	0.63	x	0.7	=	29.02	(74)
North	0.9x	0.77	x	1.75	x	13.12	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	1.75	x	8.86	x	0.63	x	0.7	=	4.74	(74)
North	0.9x	0.77	x	1.75	x	8.86	x	0.63	x	0.7	=	4.74	(74)

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North	0.9x	0.77	x	7.24	x	8.86	x	0.63	x	0.7	=	19.61	(74)
North	0.9x	0.77	x	1.75	x	8.86	x	0.63	x	0.7	=	4.74	(74)

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

(83)m=	40.59	77.57	131.81	211.71	285.2	305.31	285.05	226.15	158.47	92.33	50.07	33.84	(83)

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

(84)m=	356.6	391.92	436.56	501.13	559.3	564.43	534.26	480.13	420.2	369.57	345.14	342	(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	0.74	0.53	0.39	0.45	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=	20.11	20.24	20.46	20.76	20.94	20.99	21	21	20.96	20.72	20.37	20.09	(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	20.11	(88)

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

(89)m=	0.99	0.99	0.97	0.88	0.69	0.46	0.31	0.36	0.65	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=	18.93	19.11	19.44	19.85	20.07	20.13	20.13	20.13	20.1	19.8	19.31	18.9	(90)

fLA = Living area ÷ (4) = | 0.5 | (91)

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

(92)m=	19.52	19.68	19.95	20.31	20.51	20.56	20.57	20.57	20.53	20.26	19.84	19.5	(92)

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

(93)m=	19.52	19.68	19.95	20.31	20.51	20.56	20.57	20.57	20.53	20.26	19.84	19.5	(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	0.89	0.71	0.49	0.35	0.41	0.69	0.93	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	353.83	386.38	421.27	444.56	397.04	278.59	186.64	195.33	290.27	343.72	339.63	339.86	(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=	740.28	716.64	650.7	544.8	419.67	280.88	186.89	195.9	304.34	460.36	610.04	736.12	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	287.52	221.94	170.69	72.17	16.84	0	0	0	0	86.78	194.7	294.81	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = | 1345.45 | (98)

Space heating requirement in kWh/m²/year | 26.91 | (99)

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

Space heating:

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

TER WorkSheet: New dwelling design stage

Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		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)	287.52	221.94	170.69	72.17	16.84	0	0	0	0	86.78	194.7	294.81		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	307.51	237.37	182.56	77.19	18.01	0	0	0	0	92.81	208.23	315.31		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1438.99	(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)	167.86	148.15	156.04	140.51	138.15	124.1	119.81	130.61	130.11	145.67	153.24	164.04		
Efficiency of water heater													79.8	(216)
(217)m=	86.24	85.89	85.05	83.14	80.84	79.8	79.8	79.8	79.8	83.48	85.45	86.36		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	194.65	172.49	183.46	169.01	170.9	155.51	150.13	163.67	163.04	174.49	179.33	189.94		
Total = Sum(219a)$_{1...12}$ =													2066.62	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1438.99	
Water heating fuel used			2066.62	
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			231.81	(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	=	310.82	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	446.39	(264)
Space and water heating	(261) + (262) + (263) + (264) =			757.21	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	120.31	(268)

TER WorkSheet: New dwelling design stage

Total CO_2, kg/year	sum of (265)…(271) =	916.44	(272)
TER =		26.66	(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 17:36:34

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.7m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 108

Address : GT 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)	24.86 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	6.83 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.1 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:	0.53	
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: East	2.24m²	
Windows facing: East	2.24m²	
Windows facing: North	9.25m²	
Windows facing: North	2.24m²	
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	
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: GT 108

Address : GT 108, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.7	(1a) x	2.6	(2a) =	189.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	189.02	(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

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			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 3			9.25	x1/[1/(1.4)+ 0.04]	=	12.26			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Walls	67.08	15.97	51.11	x 0.12	=	6.13			(29)
Total area of elements, m²			67.08						(31)
Party wall			28.21	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) = 27.31 (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 7.79 (36)

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

Total fabric heat loss (33) + (36) = 35.09 (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=	14.69	14.54	14.4	13.68	13.53	12.81	12.81	12.67	13.1	13.53	13.82	14.11	(38)

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

(39)m=	49.78	49.64	49.49	48.77	48.63	47.9	47.9	47.76	48.19	48.63	48.91	49.2	

Average = Sum(39)$_{1…12}$ /12= 48.73 (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 2.31 (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 89.06 (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=	97.96	94.4	90.84	87.28	83.72	80.15	80.15	83.72	87.28	90.84	94.4	97.96

Total = Sum(44)$_{1…12}$ = 1068.71 (44)

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

(45)m=	145.28	127.06	131.12	114.31	109.68	94.65	87.71	100.64	101.85	118.69	129.56	140.69

Total = Sum(45)$_{1…12}$ = 1401.24 (45)

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

(46)m=	21.79	19.06	19.67	17.15	16.45	14.2	13.16	15.1	15.28	17.8	19.43	21.1

(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=	200.56	176.99	186.39	167.8	164.96	148.14	142.98	155.92	155.34	173.97	183.05	195.97	(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=	200.56	176.99	186.39	167.8	164.96	148.14	142.98	155.92	155.34	173.97	183.05	195.97	

Output from water heater (annual)$_{1...12}$ 2052.08 (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=	92.53	82.19	87.82	80.8	80.69	74.27	73.38	77.69	76.66	83.69	85.87	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=	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18.14	16.11	13.11	9.92	7.42	6.26	6.77	8.79	11.8	14.99	17.49	18.65	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	203.51	205.63	200.3	188.98	174.67	161.23	152.25	150.14	155.46	166.79	181.09	194.54	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	(69)
Pumps and fans gains (Table 5a)													
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	(71)
Water heating gains (Table 5)													
(72)m=	124.36	122.31	118.03	112.23	108.46	103.15	98.63	104.42	106.47	112.48	119.27	122.32	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	403.67	401.7	389.09	368.77	348.19	328.29	315.3	321	331.38	351.91	375.5	393.15	(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)	
North	0.9x	0.77	x	9.25	x	10.63	x	0.4	x	0.8	=	21.81	(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	9.25	x	20.32	x	0.4	x	0.8	=	41.68	(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	9.25	x	34.53	x	0.4	x	0.8	=	70.83	(74)

DER WorkSheet: New dwelling design stage

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	9.25	x	55.46	x	0.4	x	0.8	=	113.77	(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	9.25	x	74.72	x	0.4	x	0.8	=	153.26	(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	9.25	x	79.99	x	0.4	x	0.8	=	164.07	(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	9.25	x	74.68	x	0.4	x	0.8	=	153.18	(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	9.25	x	59.25	x	0.4	x	0.8	=	121.53	(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	9.25	x	41.52	x	0.4	x	0.8	=	85.16	(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	9.25	x	24.19	x	0.4	x	0.8	=	49.62	(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	9.25	x	13.12	x	0.4	x	0.8	=	26.91	(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	9.25	x	8.86	x	0.4	x	0.8	=	18.18	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
East	0.9x	0.77	x	2.24	x	19.64	x	0.4	x	0.8	=	9.76	(76)
East	0.9x	0.77	x	2.24	x	19.64	x	0.4	x	0.8	=	9.76	(76)
East	0.9x	0.77	x	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(76)
East	0.9x	0.77	x	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(76)
East	0.9x	0.77	x	2.24	x	63.27	x	0.4	x	0.8	=	31.43	(76)
East	0.9x	0.77	x	2.24	x	63.27	x	0.4	x	0.8	=	31.43	(76)
East	0.9x	0.77	x	2.24	x	92.28	x	0.4	x	0.8	=	45.84	(76)
East	0.9x	0.77	x	2.24	x	92.28	x	0.4	x	0.8	=	45.84	(76)
East	0.9x	0.77	x	2.24	x	113.09	x	0.4	x	0.8	=	56.18	(76)
East	0.9x	0.77	x	2.24	x	113.09	x	0.4	x	0.8	=	56.18	(76)
East	0.9x	0.77	x	2.24	x	115.77	x	0.4	x	0.8	=	57.51	(76)
East	0.9x	0.77	x	2.24	x	115.77	x	0.4	x	0.8	=	57.51	(76)
East	0.9x	0.77	x	2.24	x	110.22	x	0.4	x	0.8	=	54.75	(76)
East	0.9x	0.77	x	2.24	x	110.22	x	0.4	x	0.8	=	54.75	(76)
East	0.9x	0.77	x	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(76)
East	0.9x	0.77	x	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(76)
East	0.9x	0.77	x	2.24	x	73.59	x	0.4	x	0.8	=	36.55	(76)
East	0.9x	0.77	x	2.24	x	73.59	x	0.4	x	0.8	=	36.55	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(76)

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East	0.9x	0.77	x	2.24	x	16.15	x	0.4	x	0.8	=	8.02	(76)
East	0.9x	0.77	x	2.24	x	16.15	x	0.4	x	0.8	=	8.02	(76)

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

(83)m=	46.61	89.95	150.84	233	302.73	318.82	299.78	245.02	178.89	106.93	57.75	38.63	(83)

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

(84)m=	450.28	491.64	539.94	601.78	650.93	647.11	615.08	566.02	510.28	458.84	433.26	431.78	(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	0.88	0.68	0.47	0.34	0.39	0.64	0.93	0.99	1	(86)

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

(87)m=	20.46	20.56	20.73	20.91	20.99	21	21	21	20.99	20.89	20.64	20.44	(87)

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

(88)m=	20.35	20.36	20.36	20.37	20.37	20.38	20.38	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=	0.99	0.99	0.96	0.85	0.64	0.43	0.29	0.34	0.59	0.9	0.99	1	(89)

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

(90)m=	19.63	19.77	20.01	20.27	20.36	20.38	20.38	20.38	20.37	20.24	19.91	19.61	(90)

fLA = Living area ÷ (4) = 0.33 (91)

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

(92)m=	19.9	20.03	20.25	20.48	20.56	20.58	20.58	20.58	20.57	20.45	20.15	19.88	(92)

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

(93)m=	19.9	20.03	20.25	20.48	20.56	20.58	20.58	20.58	20.57	20.45	20.15	19.88	(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	0.99	0.96	0.86	0.65	0.44	0.31	0.35	0.61	0.91	0.98	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	447.5	485.21	518.82	516.06	425.35	286.27	190.7	199.72	309.6	415.76	426.47	429.76	(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=	776.59	751.07	680.38	564.81	431.05	286.5	190.71	199.75	312.02	479.11	638.21	771.44	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	244.84	178.66	120.2	35.1	4.24	0	0	0	0	47.13	152.45	254.21	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1036.84 (98)

Space heating requirement in kWh/m²/year 14.26 (99)

9b. Energy requirements – Community heating scheme

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

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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		1036.84	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1140.52	(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		2052.08	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2257.29	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	33.98	(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		152.78	(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) =	152.78	(331)
Energy for lighting (calculated in Appendix L)		320.42	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-615.76	(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	=	552.81	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	17.63	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	570.44	(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) =			570.44	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	79.29	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	166.3	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-319.58	(380)
Total CO2, kg/year	sum of (376)…(382) =			496.45	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			6.83	(384)
EI rating (section 14)				94.35	(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: GT 108

Address : GT 108, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.7	(1a) x	2.6	(2a) =	189.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	189.02	(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) =	0.38	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 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]

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

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)

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]

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

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)
(24d)m=	0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)
(25)m=	0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 3			9.25	x1/[1/(1.4)+ 0.04] =	12.26			(27)
Windows Type 4			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Walls	67.08	15.97	51.11	x 0.18 =	9.2			(29)
Total area of elements, m²			67.08					(31)
Party wall			28.21	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) = 30.37 (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 5.92 (36)

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

Total fabric heat loss (33) + (36) = 36.29 (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=	38.43	38.15	37.88	36.58	36.34	35.21	35.21	35	35.65	36.34	36.83	37.34	(38)

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

(39)m=	74.72	74.44	74.17	72.87	72.63	71.5	71.5	71.29	71.93	72.63	73.12	73.63	

Average = Sum(39)$_{1…12}$ /12= 72.87 (39)

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

(40)m=	1.03	1.02	1.02	1	1	0.98	0.98	0.98	0.99	1	1.01	1.01

Average = Sum(40)$_{1…12}$ /12= 1 (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 2.31 (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 89.06 (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=	97.96	94.4	90.84	87.28	83.72	80.15	80.15	83.72	87.28	90.84	94.4	97.96

Total = Sum(44)$_{1…12}$ = 1068.71 (44)

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

(45)m=	145.28	127.06	131.12	114.31	109.68	94.65	87.71	100.64	101.85	118.69	129.56	140.69

Total = Sum(45)$_{1…12}$ = 1401.24 (45)

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

(46)m=	21.79	19.06	19.67	17.15	16.45	14.2	13.16	15.1	15.28	17.8	19.43	21.1	(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=	191.87	169.15	177.71	159.4	156.28	139.74	134.3	147.24	146.94	165.29	174.65	187.29	(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=	191.87	169.15	177.71	159.4	156.28	139.74	134.3	147.24	146.94	165.29	174.65	187.29

Output from water heater (annual)$_{1...12}$ 1949.86 (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=	85.58	75.92	80.87	74.08	73.75	67.54	66.44	70.74	69.94	76.74	79.15	84.06	(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=	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.49	(66)

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

(67)m=	18.15	16.12	13.11	9.93	7.42	6.26	6.77	8.8	11.81	14.99	17.5	18.66	(67)

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

(68)m=	203.51	205.63	200.3	188.98	174.67	161.23	152.25	150.14	155.46	166.79	181.09	194.54	(68)

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

(69)m=	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	(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=	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	(71)

Water heating gains (Table 5)

(72)m=	115.03	112.97	108.7	102.89	99.12	93.81	89.3	95.08	97.14	103.15	109.93	112.98	(72)

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

(73)m=	397.34	395.37	382.76	362.44	341.86	321.96	308.97	314.67	325.05	345.58	369.18	386.82	(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	9.25	x	10.63	x	0.63	x	0.7	=	30.06	(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	9.25	x	20.32	x	0.63	x	0.7	=	57.45	(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	9.25	x	34.53	x	0.63	x	0.7	=	97.61	(74)

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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	9.25	x	55.46	x	0.63	x	0.7	=	156.79	(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	9.25	x	74.72	x	0.63	x	0.7	=	211.22	(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	9.25	x	79.99	x	0.63	x	0.7	=	226.11	(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	9.25	x	74.68	x	0.63	x	0.7	=	211.1	(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	9.25	x	59.25	x	0.63	x	0.7	=	167.48	(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	9.25	x	41.52	x	0.63	x	0.7	=	117.36	(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	9.25	x	24.19	x	0.63	x	0.7	=	68.38	(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	9.25	x	13.12	x	0.63	x	0.7	=	37.08	(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	9.25	x	8.86	x	0.63	x	0.7	=	25.06	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.63	x	0.7	=	6.07	(74)
East	0.9x	0.77	x	2.24	x	19.64	x	0.63	x	0.7	=	13.45	(76)
East	0.9x	0.77	x	2.24	x	19.64	x	0.63	x	0.7	=	13.45	(76)
East	0.9x	0.77	x	2.24	x	38.42	x	0.63	x	0.7	=	26.3	(76)
East	0.9x	0.77	x	2.24	x	38.42	x	0.63	x	0.7	=	26.3	(76)
East	0.9x	0.77	x	2.24	x	63.27	x	0.63	x	0.7	=	43.32	(76)
East	0.9x	0.77	x	2.24	x	63.27	x	0.63	x	0.7	=	43.32	(76)
East	0.9x	0.77	x	2.24	x	92.28	x	0.63	x	0.7	=	63.17	(76)
East	0.9x	0.77	x	2.24	x	92.28	x	0.63	x	0.7	=	63.17	(76)
East	0.9x	0.77	x	2.24	x	113.09	x	0.63	x	0.7	=	77.42	(76)
East	0.9x	0.77	x	2.24	x	113.09	x	0.63	x	0.7	=	77.42	(76)
East	0.9x	0.77	x	2.24	x	115.77	x	0.63	x	0.7	=	79.25	(76)
East	0.9x	0.77	x	2.24	x	115.77	x	0.63	x	0.7	=	79.25	(76)
East	0.9x	0.77	x	2.24	x	110.22	x	0.63	x	0.7	=	75.45	(76)
East	0.9x	0.77	x	2.24	x	110.22	x	0.63	x	0.7	=	75.45	(76)
East	0.9x	0.77	x	2.24	x	94.68	x	0.63	x	0.7	=	64.81	(76)
East	0.9x	0.77	x	2.24	x	94.68	x	0.63	x	0.7	=	64.81	(76)
East	0.9x	0.77	x	2.24	x	73.59	x	0.63	x	0.7	=	50.38	(76)
East	0.9x	0.77	x	2.24	x	73.59	x	0.63	x	0.7	=	50.38	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.63	x	0.7	=	31.21	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.63	x	0.7	=	31.21	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.63	x	0.7	=	16.76	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.63	x	0.7	=	16.76	(76)

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East	0.9x	0.77	x	2.24	x	16.15	x	0.63	x	0.7	=	11.06	(76)
East	0.9x	0.77	x	2.24	x	16.15	x	0.63	x	0.7	=	11.06	(76)

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

(83)m=	64.23	123.96	207.88	321.11	417.2	439.37	413.13	337.67	246.54	147.36	79.59	53.24	(83)

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

(84)m=	461.57	519.33	590.65	683.55	759.07	761.33	722.1	652.34	571.59	492.94	448.77	440.06	(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	0.98	0.93	0.8	0.59	0.43	0.5	0.78	0.97	0.99	1	(86)

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

(87)m=	19.96	20.1	20.35	20.68	20.9	20.99	21	21	20.94	20.63	20.24	19.94	(87)

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

(88)m=	20.06	20.06	20.07	20.08	20.08	20.1	20.1	20.1	20.09	20.08	20.08	20.07	(88)

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

(89)m=	1	0.99	0.98	0.91	0.74	0.51	0.35	0.4	0.71	0.95	0.99	1	(89)

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

(90)m=	18.67	18.88	19.24	19.71	20	20.09	20.1	20.1	20.04	19.66	19.1	18.66	(90)

fLA = Living area ÷ (4) = | 0.33 | (91)

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

(92)m=	19.09	19.28	19.6	20.03	20.29	20.38	20.39	20.39	20.34	19.98	19.47	19.08	(92)

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

(93)m=	19.09	19.28	19.6	20.03	20.29	20.38	20.39	20.39	20.34	19.98	19.47	19.08	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.97	0.91	0.76	0.54	0.37	0.43	0.73	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	459.37	514.35	575.34	622.83	573.48	407.55	270.46	283.17	418.15	467.96	444.27	438.42	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1105.38	1070.16	971.5	810.8	624.13	413.44	271.09	284.57	448.54	680.9	904.77	1095.44	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	480.63	373.51	294.75	135.34	37.69	0	0	0	0	158.42	331.56	488.83	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = | 2300.72 | (98)

Space heating requirement in kWh/m²/year | 31.65 | (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)	480.63	373.51	294.75	135.34	37.69	0	0	0	0	158.42	331.56	488.83		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	514.05	399.47	315.24	144.75	40.31	0	0	0	0	169.44	354.61	522.81		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2460.67	(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)	191.87	169.15	177.71	159.4	156.28	139.74	134.3	147.24	146.94	165.29	174.65	187.29		
Efficiency of water heater													79.8	(216)
(217)m=	87.17	86.87	86.15	84.38	81.68	79.8	79.8	79.8	79.8	84.7	86.5	87.26		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	220.13	194.72	206.27	188.91	191.34	175.11	168.3	184.51	184.13	195.14	201.91	214.64		
Total = Sum(219a)$_{1...12}$ =													2325.1	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2460.67	
Water heating fuel used			2325.1	
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			320.55	(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	=	531.5	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	502.22	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1033.73	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.36	(268)

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Total CO_2, kg/year	sum of (265)…(271) =	1239.01	(272)
TER =		24.86	(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 17:34:40

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 90.4m²	
Site Reference :	Maitland Park Estate	**Plot Reference:**	GT 303
Address :	GT 303, 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)	20.47 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	5.57 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	36.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.4 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	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: East	9.25m²	
Windows facing: East	1.5m²	
Windows facing: East	4.01m²	
Windows facing: South	3.95m²	
Windows facing: South	2.24m²	
Windows facing: East	1.5m²	
Windows facing: South	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: GT 303

Address : GT 303, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	90.4	(1a) x	2.6	(2a) =	235.04	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	90.4	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		235.04	(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			9.25	x1/[1/(1.4)+ 0.04]	=	12.26			(27)
Windows Type 2			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 3			4.01	x1/[1/(1.4)+ 0.04]	=	5.32			(27)
Windows Type 4			3.95	x1/[1/(1.4)+ 0.04]	=	5.24			(27)
Windows Type 5			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 6			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 7			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Walls	54.86	23.95	30.91	x 0.12	=	3.71			(29)
Roof	14.8	0	14.8	x 0.1	=	1.48			(30)
Total area of elements, m²			69.66						(31)
Party wall			54.86	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) = 36.94 (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 9.48 (36)

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

Total fabric heat loss (33) + (36) = 46.42 (37)

DER WorkSheet: New dwelling design stage

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=	17.52	17.35	17.19	16.37	16.2	15.38	15.38	15.21	15.71	16.2	16.53	16.86	(38)

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

(39)m=	63.94	63.78	63.61	62.79	62.62	61.8	61.8	61.63	62.13	62.62	62.95	63.28	

Average = Sum(39)$_{1…12}$ /12= 62.75 (39)

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

(40)m=	0.71	0.71	0.7	0.69	0.69	0.68	0.68	0.68	0.69	0.69	0.7	0.7	

Average = Sum(40)$_{1…12}$ /12= 0.69 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.63 (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 96.69 (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=	106.36	102.49	98.62	94.76	90.89	87.02	87.02	90.89	94.76	98.62	102.49	106.36	

Total = Sum(44)$_{1…12}$ = 1160.28 (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=	157.73	137.95	142.35	124.11	119.08	102.76	95.22	109.27	110.57	128.86	140.66	152.75	

Total = Sum(45)$_{1…12}$ = 1521.31 (45)

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

(46)m=	23.66	20.69	21.35	18.62	17.86	15.41	14.28	16.39	16.59	19.33	21.1	22.91	(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=	213	187.88	197.63	177.6	174.36	156.25	150.5	164.54	164.07	184.14	194.16	208.03	(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=	213	187.88	197.63	177.6	174.36	156.25	150.5	164.54	164.07	184.14	194.16	208.03

Output from water heater (annual)$_{1…12}$ — 2172.15 (64)

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

(65)m=	96.67	85.81	91.55	84.06	83.82	76.96	75.88	80.55	79.56	87.07	89.57	95.01	(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=	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	21.38	18.99	15.44	11.69	8.74	7.38	7.97	10.36	13.91	17.66	20.61	21.97	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	239.81	242.3	236.03	222.68	205.83	189.99	179.41	176.92	183.19	196.54	213.39	229.23	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	(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=	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	(71)
Water heating gains (Table 5)													
(72)m=	129.93	127.69	123.06	116.75	112.66	106.89	101.99	108.27	110.5	117.03	124.4	127.7	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	453.59	451.45	436.99	413.59	389.69	366.73	351.84	358.02	370.07	393.69	420.87	441.37	(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)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	9.25	x	19.64	x	0.4	x	0.8	=	40.29	(76)
East	0.9x	0.77	x	1.5	x	19.64	x	0.4	x	0.8	=	6.53	(76)
East	0.9x	0.77	x	4.01	x	19.64	x	0.4	x	0.8	=	17.47	(76)
East	0.9x	0.77	x	1.5	x	19.64	x	0.4	x	0.8	=	6.53	(76)
East	0.9x	0.77	x	9.25	x	38.42	x	0.4	x	0.8	=	78.81	(76)
East	0.9x	0.77	x	1.5	x	38.42	x	0.4	x	0.8	=	12.78	(76)
East	0.9x	0.77	x	4.01	x	38.42	x	0.4	x	0.8	=	34.17	(76)
East	0.9x	0.77	x	1.5	x	38.42	x	0.4	x	0.8	=	12.78	(76)
East	0.9x	0.77	x	9.25	x	63.27	x	0.4	x	0.8	=	129.79	(76)
East	0.9x	0.77	x	1.5	x	63.27	x	0.4	x	0.8	=	21.05	(76)
East	0.9x	0.77	x	4.01	x	63.27	x	0.4	x	0.8	=	56.27	(76)
East	0.9x	0.77	x	1.5	x	63.27	x	0.4	x	0.8	=	21.05	(76)
East	0.9x	0.77	x	9.25	x	92.28	x	0.4	x	0.8	=	189.29	(76)
East	0.9x	0.77	x	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(76)
East	0.9x	0.77	x	4.01	x	92.28	x	0.4	x	0.8	=	82.06	(76)
East	0.9x	0.77	x	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(76)
East	0.9x	0.77	x	9.25	x	113.09	x	0.4	x	0.8	=	231.98	(76)
East	0.9x	0.77	x	1.5	x	113.09	x	0.4	x	0.8	=	37.62	(76)
East	0.9x	0.77	x	4.01	x	113.09	x	0.4	x	0.8	=	100.57	(76)
East	0.9x	0.77	x	1.5	x	113.09	x	0.4	x	0.8	=	37.62	(76)
East	0.9x	0.77	x	9.25	x	115.77	x	0.4	x	0.8	=	237.48	(76)
East	0.9x	0.77	x	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	x	4.01	x	115.77	x	0.4	x	0.8	=	102.95	(76)
East	0.9x	0.77	x	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	x	9.25	x	110.22	x	0.4	x	0.8	=	226.09	(76)
East	0.9x	0.77	x	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(76)
East	0.9x	0.77	x	4.01	x	110.22	x	0.4	x	0.8	=	98.01	(76)
East	0.9x	0.77	x	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(76)
East	0.9x	0.77	x	9.25	x	94.68	x	0.4	x	0.8	=	194.21	(76)
East	0.9x	0.77	x	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(76)
East	0.9x	0.77	x	4.01	x	94.68	x	0.4	x	0.8	=	84.19	(76)
East	0.9x	0.77	x	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(76)
East	0.9x	0.77	x	9.25	x	73.59	x	0.4	x	0.8	=	150.95	(76)
East	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(76)
East	0.9x	0.77	x	4.01	x	73.59	x	0.4	x	0.8	=	65.44	(76)
East	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(76)
East	0.9x	0.77	x	9.25	x	45.59	x	0.4	x	0.8	=	93.52	(76)
East	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(76)
East	0.9x	0.77	x	4.01	x	45.59	x	0.4	x	0.8	=	40.54	(76)
East	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(76)
East	0.9x	0.77	x	9.25	x	24.49	x	0.4	x	0.8	=	50.23	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(76)
East	0.9x	0.77	x	4.01	x	24.49	x	0.4	x	0.8	=	21.78	(76)
East	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(76)
East	0.9x	0.77	x	9.25	x	16.15	x	0.4	x	0.8	=	33.13	(76)
East	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	=	5.37	(76)
East	0.9x	0.77	x	4.01	x	16.15	x	0.4	x	0.8	=	14.36	(76)
East	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	=	5.37	(76)
South	0.9x	0.77	x	3.95	x	46.75	x	0.4	x	0.8	=	40.95	(78)
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	3.95	x	76.57	x	0.4	x	0.8	=	67.07	(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	3.95	x	97.53	x	0.4	x	0.8	=	85.43	(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	3.95	x	110.23	x	0.4	x	0.8	=	96.56	(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	3.95	x	114.87	x	0.4	x	0.8	=	100.62	(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	3.95	x	110.55	x	0.4	x	0.8	=	96.83	(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	3.95	x	108.01	x	0.4	x	0.8	=	94.61	(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	3.95	x	104.89	x	0.4	x	0.8	=	91.88	(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	3.95	x	101.89	x	0.4	x	0.8	=	89.25	(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	3.95	x	82.59	x	0.4	x	0.8	=	72.34	(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	3.95	x	55.42	x	0.4	x	0.8	=	48.54	(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	3.95	x	40.4	x	0.4	x	0.8	=	35.39	(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)

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

(83)m=	150.55	269.11	394.48	520.73	603.69	605.97	581.62	520.26	439.1	305.22	182.81	127.13	(83)

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

(84)m=	604.13	720.56	831.47	934.32	993.38	972.69	933.46	878.28	809.17	698.92	603.68	568.5	(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=	0.99	0.98	0.92	0.78	0.58	0.41	0.29	0.32	0.53	0.85	0.98	1	(86)

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

(87)m=	20.47	20.64	20.83	20.96	21	21	21	21	21	20.94	20.68	20.44	(87)

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

(88)m=	20.33	20.34	20.34	20.35	20.35	20.36	20.36	20.36	20.35	20.35	20.34	20.34	(88)

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

(89)m=	0.99	0.97	0.91	0.74	0.54	0.37	0.25	0.28	0.48	0.82	0.98	0.99	(89)

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

(90)m=	19.63	19.87	20.13	20.3	20.34	20.36	20.36	20.36	20.35	20.28	19.94	19.59	(90)

fLA = Living area ÷ (4) = 0.33 (91)

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

(92)m=	19.9	20.12	20.36	20.52	20.56	20.56	20.56	20.57	20.56	20.49	20.18	19.86	(92)

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

(93)m=	19.9	20.12	20.36	20.52	20.56	20.56	20.56	20.57	20.56	20.49	20.18	19.86	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.97	0.91	0.75	0.56	0.38	0.26	0.29	0.5	0.83	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	598.65	699.38	754.55	702.29	551.75	368.49	245.02	256.76	400.54	576.65	587.57	564.95	(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=	997.71	970.48	881.36	729.46	554.55	368.61	245.03	256.77	401.44	619.62	823.34	991.15	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	296.9	182.18	94.34	19.56	2.08	0	0	0	0	31.97	169.76	317.09	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1113.88 (98)

Space heating requirement in kWh/m²/year 12.32 (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		1113.88	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1225.27	(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		2172.15	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2389.36	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	36.15	(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		189.97	(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) =	189.97	(331)
Energy for lighting (calculated in Appendix L)		377.57	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-766.03	(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	=	588.09	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.76	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	606.85	(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) =			606.85	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	98.59	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	195.96	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-397.57	(380)
Total CO2, kg/year	sum of (376)…(382) =			503.83	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			5.57	(384)
EI rating (section 14)				95.01	(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: GT 303

Address : GT 303, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	90.4	(1a) x	2.6	(2a) =	235.04	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	90.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	235.04	(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) =		0.32	(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	0.35	0.3	0.3	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=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	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=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	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	
Windows Type 1			8.73	x1/[1/(1.4)+ 0.04] =	11.57			(27)
Windows Type 2			1.42	x1/[1/(1.4)+ 0.04] =	1.88			(27)
Windows Type 3			3.78	x1/[1/(1.4)+ 0.04] =	5.01			(27)
Windows Type 4			3.73	x1/[1/(1.4)+ 0.04] =	4.95			(27)
Windows Type 5			2.11	x1/[1/(1.4)+ 0.04] =	2.8			(27)
Windows Type 6			1.42	x1/[1/(1.4)+ 0.04] =	1.88			(27)
Windows Type 7			1.42	x1/[1/(1.4)+ 0.04] =	1.88			(27)
Walls	54.86	22.61	32.25	x 0.18 =	5.81			(29)
Roof	14.8	0	14.8	x 0.13 =	1.92			(30)
Total area of elements, m²			69.66					(31)
Party wall			54.86	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) = 37.7 (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 6.29 (36)

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

Total fabric heat loss (33) + (36) = 44 (37)

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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=	45.28	45.03	44.78	43.62	43.4	42.39	42.39	42.2	42.78	43.4	43.84	44.3	(38)

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

(39)m=	89.27	89.02	88.77	87.61	87.4	86.38	86.38	86.2	86.77	87.4	87.84	88.3	

Average = $Sum(39)_{1...12}$ /12= 87.61 (39)

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

(40)m=	0.99	0.98	0.98	0.97	0.97	0.96	0.96	0.95	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 2.63 (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 96.69 (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=	106.36	102.49	98.62	94.76	90.89	87.02	87.02	90.89	94.76	98.62	102.49	106.36	

Total = $Sum(44)_{1...12}$ = 1160.28 (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=	157.73	137.95	142.35	124.11	119.08	102.76	95.22	109.27	110.57	128.86	140.66	152.75	

Total = $Sum(45)_{1...12}$ = 1521.31 (45)

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

(46)m=	23.66	20.69	21.35	18.62	17.86	15.41	14.28	16.39	16.59	19.33	21.1	22.91	(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)

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

(57)m=	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=	204.32	180.03	188.95	169.2	165.68	147.85	141.82	155.86	155.66	175.46	185.75	199.35	(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=	204.32	180.03	188.95	169.2	165.68	147.85	141.82	155.86	155.66	175.46	185.75	199.35

Output from water heater (annual)$_{1...12}$ — 2069.93 (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=	89.72	79.54	84.61	77.34	76.87	70.24	68.94	73.61	72.84	80.12	82.84	88.07	(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=	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	(66)

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

(67)m=	21.38	18.99	15.44	11.69	8.74	7.38	7.97	10.36	13.91	17.66	20.61	21.97	(67)

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

(68)m=	239.81	242.3	236.03	222.68	205.83	189.99	179.41	176.92	183.19	196.54	213.39	229.23	(68)

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

(69)m=	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	(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=	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	(71)

Water heating gains (Table 5)

(72)m=	120.59	118.36	113.72	107.41	103.32	97.56	92.66	98.93	101.17	107.69	115.06	118.37	(72)

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

(73)m=	447.25	445.11	430.66	407.25	383.35	360.39	345.5	351.68	363.73	387.36	414.53	435.04	(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)

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East	0.9x	0.77	x	8.73	x	19.64	x	0.63	x	0.7	=	52.4	(76)
East	0.9x	0.77	x	1.42	x	19.64	x	0.63	x	0.7	=	8.52	(76)
East	0.9x	0.77	x	3.78	x	19.64	x	0.63	x	0.7	=	22.69	(76)
East	0.9x	0.77	x	1.42	x	19.64	x	0.63	x	0.7	=	8.52	(76)
East	0.9x	0.77	x	8.73	x	38.42	x	0.63	x	0.7	=	102.51	(76)
East	0.9x	0.77	x	1.42	x	38.42	x	0.63	x	0.7	=	16.67	(76)
East	0.9x	0.77	x	3.78	x	38.42	x	0.63	x	0.7	=	44.38	(76)
East	0.9x	0.77	x	1.42	x	38.42	x	0.63	x	0.7	=	16.67	(76)
East	0.9x	0.77	x	8.73	x	63.27	x	0.63	x	0.7	=	168.81	(76)
East	0.9x	0.77	x	1.42	x	63.27	x	0.63	x	0.7	=	27.46	(76)
East	0.9x	0.77	x	3.78	x	63.27	x	0.63	x	0.7	=	73.09	(76)
East	0.9x	0.77	x	1.42	x	63.27	x	0.63	x	0.7	=	27.46	(76)
East	0.9x	0.77	x	8.73	x	92.28	x	0.63	x	0.7	=	246.2	(76)
East	0.9x	0.77	x	1.42	x	92.28	x	0.63	x	0.7	=	40.05	(76)
East	0.9x	0.77	x	3.78	x	92.28	x	0.63	x	0.7	=	106.6	(76)
East	0.9x	0.77	x	1.42	x	92.28	x	0.63	x	0.7	=	40.05	(76)
East	0.9x	0.77	x	8.73	x	113.09	x	0.63	x	0.7	=	301.73	(76)
East	0.9x	0.77	x	1.42	x	113.09	x	0.63	x	0.7	=	49.08	(76)
East	0.9x	0.77	x	3.78	x	113.09	x	0.63	x	0.7	=	130.65	(76)
East	0.9x	0.77	x	1.42	x	113.09	x	0.63	x	0.7	=	49.08	(76)
East	0.9x	0.77	x	8.73	x	115.77	x	0.63	x	0.7	=	308.88	(76)
East	0.9x	0.77	x	1.42	x	115.77	x	0.63	x	0.7	=	50.24	(76)
East	0.9x	0.77	x	3.78	x	115.77	x	0.63	x	0.7	=	133.74	(76)
East	0.9x	0.77	x	1.42	x	115.77	x	0.63	x	0.7	=	50.24	(76)
East	0.9x	0.77	x	8.73	x	110.22	x	0.63	x	0.7	=	294.06	(76)
East	0.9x	0.77	x	1.42	x	110.22	x	0.63	x	0.7	=	47.83	(76)
East	0.9x	0.77	x	3.78	x	110.22	x	0.63	x	0.7	=	127.33	(76)
East	0.9x	0.77	x	1.42	x	110.22	x	0.63	x	0.7	=	47.83	(76)
East	0.9x	0.77	x	8.73	x	94.68	x	0.63	x	0.7	=	252.6	(76)
East	0.9x	0.77	x	1.42	x	94.68	x	0.63	x	0.7	=	41.09	(76)
East	0.9x	0.77	x	3.78	x	94.68	x	0.63	x	0.7	=	109.37	(76)
East	0.9x	0.77	x	1.42	x	94.68	x	0.63	x	0.7	=	41.09	(76)
East	0.9x	0.77	x	8.73	x	73.59	x	0.63	x	0.7	=	196.34	(76)
East	0.9x	0.77	x	1.42	x	73.59	x	0.63	x	0.7	=	31.94	(76)
East	0.9x	0.77	x	3.78	x	73.59	x	0.63	x	0.7	=	85.01	(76)
East	0.9x	0.77	x	1.42	x	73.59	x	0.63	x	0.7	=	31.94	(76)
East	0.9x	0.77	x	8.73	x	45.59	x	0.63	x	0.7	=	121.63	(76)
East	0.9x	0.77	x	1.42	x	45.59	x	0.63	x	0.7	=	19.78	(76)
East	0.9x	0.77	x	3.78	x	45.59	x	0.63	x	0.7	=	52.67	(76)
East	0.9x	0.77	x	1.42	x	45.59	x	0.63	x	0.7	=	19.78	(76)
East	0.9x	0.77	x	8.73	x	24.49	x	0.63	x	0.7	=	65.34	(76)

East	0.9x	0.77	x	1.42	x	24.49	x	0.63	x	0.7	=	10.63	(76)
East	0.9x	0.77	x	3.78	x	24.49	x	0.63	x	0.7	=	28.29	(76)
East	0.9x	0.77	x	1.42	x	24.49	x	0.63	x	0.7	=	10.63	(76)
East	0.9x	0.77	x	8.73	x	16.15	x	0.63	x	0.7	=	43.09	(76)
East	0.9x	0.77	x	1.42	x	16.15	x	0.63	x	0.7	=	7.01	(76)
East	0.9x	0.77	x	3.78	x	16.15	x	0.63	x	0.7	=	18.66	(76)
East	0.9x	0.77	x	1.42	x	16.15	x	0.63	x	0.7	=	7.01	(76)
South	0.9x	0.77	x	3.73	x	46.75	x	0.63	x	0.7	=	53.29	(78)
South	0.9x	0.77	x	2.11	x	46.75	x	0.63	x	0.7	=	30.15	(78)
South	0.9x	0.77	x	1.42	x	46.75	x	0.63	x	0.7	=	20.29	(78)
South	0.9x	0.77	x	3.73	x	76.57	x	0.63	x	0.7	=	87.28	(78)
South	0.9x	0.77	x	2.11	x	76.57	x	0.63	x	0.7	=	49.37	(78)
South	0.9x	0.77	x	1.42	x	76.57	x	0.63	x	0.7	=	33.23	(78)
South	0.9x	0.77	x	3.73	x	97.53	x	0.63	x	0.7	=	111.18	(78)
South	0.9x	0.77	x	2.11	x	97.53	x	0.63	x	0.7	=	62.89	(78)
South	0.9x	0.77	x	1.42	x	97.53	x	0.63	x	0.7	=	42.33	(78)
South	0.9x	0.77	x	3.73	x	110.23	x	0.63	x	0.7	=	125.66	(78)
South	0.9x	0.77	x	2.11	x	110.23	x	0.63	x	0.7	=	71.08	(78)
South	0.9x	0.77	x	1.42	x	110.23	x	0.63	x	0.7	=	47.84	(78)
South	0.9x	0.77	x	3.73	x	114.87	x	0.63	x	0.7	=	130.95	(78)
South	0.9x	0.77	x	2.11	x	114.87	x	0.63	x	0.7	=	74.07	(78)
South	0.9x	0.77	x	1.42	x	114.87	x	0.63	x	0.7	=	49.85	(78)
South	0.9x	0.77	x	3.73	x	110.55	x	0.63	x	0.7	=	126.02	(78)
South	0.9x	0.77	x	2.11	x	110.55	x	0.63	x	0.7	=	71.29	(78)
South	0.9x	0.77	x	1.42	x	110.55	x	0.63	x	0.7	=	47.97	(78)
South	0.9x	0.77	x	3.73	x	108.01	x	0.63	x	0.7	=	123.13	(78)
South	0.9x	0.77	x	2.11	x	108.01	x	0.63	x	0.7	=	69.65	(78)
South	0.9x	0.77	x	1.42	x	108.01	x	0.63	x	0.7	=	46.87	(78)
South	0.9x	0.77	x	3.73	x	104.89	x	0.63	x	0.7	=	119.57	(78)
South	0.9x	0.77	x	2.11	x	104.89	x	0.63	x	0.7	=	67.64	(78)
South	0.9x	0.77	x	1.42	x	104.89	x	0.63	x	0.7	=	45.52	(78)
South	0.9x	0.77	x	3.73	x	101.89	x	0.63	x	0.7	=	116.14	(78)
South	0.9x	0.77	x	2.11	x	101.89	x	0.63	x	0.7	=	65.7	(78)
South	0.9x	0.77	x	1.42	x	101.89	x	0.63	x	0.7	=	44.22	(78)
South	0.9x	0.77	x	3.73	x	82.59	x	0.63	x	0.7	=	94.14	(78)
South	0.9x	0.77	x	2.11	x	82.59	x	0.63	x	0.7	=	53.25	(78)
South	0.9x	0.77	x	1.42	x	82.59	x	0.63	x	0.7	=	35.84	(78)
South	0.9x	0.77	x	3.73	x	55.42	x	0.63	x	0.7	=	63.17	(78)
South	0.9x	0.77	x	2.11	x	55.42	x	0.63	x	0.7	=	35.74	(78)
South	0.9x	0.77	x	1.42	x	55.42	x	0.63	x	0.7	=	24.05	(78)
South	0.9x	0.77	x	3.73	x	40.4	x	0.63	x	0.7	=	46.05	(78)

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South	0.9x	0.77	x	2.11	x	40.4	x	0.63	x	0.7	=	26.05	(78)
South	0.9x	0.77	x	1.42	x	40.4	x	0.63	x	0.7	=	17.53	(78)

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

(83)m=	195.87	350.12	513.23	677.48	785.41	788.38	756.7	676.87	571.28	397.1	237.84	165.4	(83)

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

(84)m=	643.12	795.24	943.89	1084.74	1168.76	1148.77	1102.21	1028.56	935.01	784.46	652.37	600.44	(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	0.84	0.67	0.48	0.34	0.38	0.62	0.91	0.99	1	(86)

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

(87)m=	20.09	20.3	20.58	20.84	20.96	21	21	21	20.98	20.79	20.38	20.05	(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	20.12	20.11	20.11	20.1	(88)

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

(89)m=	0.99	0.98	0.93	0.81	0.61	0.41	0.28	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=	18.88	19.2	19.59	19.94	20.08	20.12	20.12	20.12	20.1	19.88	19.32	18.84	(90)

fLA = Living area ÷ (4) = 0.33 (91)

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

(92)m=	19.28	19.56	19.91	20.23	20.37	20.4	20.41	20.41	20.39	20.18	19.66	19.23	(92)

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

(93)m=	19.28	19.56	19.91	20.23	20.37	20.4	20.41	20.41	20.39	20.18	19.66	19.23	(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=	0.99	0.98	0.93	0.81	0.63	0.43	0.3	0.34	0.57	0.88	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	637.88	776.08	878.15	881.14	734.68	499.1	328.6	345.02	535.65	689.47	639.11	596.96	(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=	1337.02	1304.7	1190.46	993.04	757.55	501.32	328.8	345.4	545.79	837.13	1103.55	1327.16	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	520.16	355.23	232.36	80.57	17.01	0	0	0	0	109.85	334.4	543.27	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 2192.85 (98)

Space heating requirement in kWh/m²/year 24.26 (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)	520.16	355.23	232.36	80.57	17.01	0	0	0	0	109.85	334.4	543.27		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	556.32	379.92	248.51	86.17	18.19	0	0	0	0	117.49	357.65	581.04		(211)
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													2345.29	(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)	204.32	180.03	188.95	169.2	165.68	147.85	141.82	155.86	155.66	175.46	185.75	199.35		
Efficiency of water heater													79.8	(216)
(217)m=	87.2	86.59	85.37	82.96	80.69	79.8	79.8	79.8	79.8	83.61	86.36	87.36		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	234.31	207.91	221.34	203.94	205.33	185.28	177.71	195.32	195.07	209.86	215.08	228.2		
Total = Sum(219a)$_{1...12}$ =													2479.34	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2345.29	
Water heating fuel used			2479.34	
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			377.57	(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	=	506.58	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	535.54	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1042.12	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	195.96	(268)

Total CO2, kg/year	sum of (265)…(271) =	1277	(272)
TER =		20.47	(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 17:35:00

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.3m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 304

Address : GT 304, 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)	22.72 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	5.86 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	37.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	31.4 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	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):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South	2.24m²	
Windows facing: North	2.24m²	
Windows facing: North	1.5m²	
Windows facing: North	6.73m²	
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: GT 304

Address : GT 304, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.3	(1a) x	2.6	(2a) =	187.98	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		187.98	(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

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			2.24	x1/[1/(1.4)+ 0.04] =	2.97			(27)
Windows Type 3			1.5	x1/[1/(1.4)+ 0.04] =	1.99			(27)
Windows Type 4			6.73	x1/[1/(1.4)+ 0.04] =	8.92			(27)
Walls	33.88	12.71	21.17	x 0.12 =	2.54			(29)
Roof	14.9	0	14.9	x 0.1 =	1.49			(30)
Total area of elements, m²			48.78					(31)
Party wall			54.18	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) = 20.88 (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 6.78 (36)

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

Total fabric heat loss (33) + (36) = 27.66 (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=	14.01	13.88	13.75	13.09	12.96	12.3	12.3	12.17	12.56	12.96	13.22	13.48	(38)

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

(39)m=	41.68	41.54	41.41	40.75	40.62	39.96	39.96	39.83	40.23	40.62	40.88	41.15	

Average = Sum(39)$_{1…12}$ /12= 40.72 (39)

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

(40)m=	0.58	0.57	0.57	0.56	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.57

Average = Sum(40)$_{1…12}$ /12= 0.56 (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 2.3 (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 88.84 (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=	97.72	94.17	90.62	87.06	83.51	79.96	79.96	83.51	87.06	90.62	94.17	97.72

Total = Sum(44)$_{1…12}$ = 1066.08 (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=	144.92	126.75	130.79	114.03	109.41	94.42	87.49	100.4	101.6	118.4	129.24	140.35

Total = Sum(45)$_{1…12}$ = 1397.8 (45)

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

(46)m=	21.74	19.01	19.62	17.1	16.41	14.16	13.12	15.06	15.24	17.76	19.39	21.05	(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=	200.2	176.68	186.07	167.52	164.69	147.91	142.77	155.67	155.09	173.68	182.74	195.63	(62)

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

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

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

Output from water heater

(64)m=	200.2	176.68	186.07	167.52	164.69	147.91	142.77	155.67	155.09	173.68	182.74	195.63	

Output from water heater (annual)$_{1...12}$ 2048.64 (64)

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

(65)m=	92.41	82.09	87.71	80.71	80.6	74.19	73.31	77.6	76.58	83.59	85.77	90.89	(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=	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	(66)

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

(67)m=	18.18	16.15	13.13	9.94	7.43	6.27	6.78	8.81	11.83	15.02	17.53	18.69	(67)

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

(68)m=	202.6	204.71	199.41	188.13	173.89	160.51	151.57	149.47	154.77	166.05	180.28	193.67	(68)

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

(69)m=	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	(71)

Water heating gains (Table 5)

(72)m=	124.2	122.15	117.89	112.1	108.34	103.04	98.54	104.31	106.35	112.35	119.12	122.16	(72)

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

(73)m=	402.5	400.52	387.94	367.68	347.17	327.33	314.4	320.1	330.46	350.93	374.44	392.02	(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)	
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	1.5	x	10.63	x	0.4	x	0.8	=	3.54	(74)
North	0.9x	0.77	x	6.73	x	10.63	x	0.4	x	0.8	=	15.87	(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	1.5	x	20.32	x	0.4	x	0.8	=	6.76	(74)

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North	0.9x	0.77	x	6.73	x	20.32	x	0.4	x	0.8	=	30.33	(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	1.5	x	34.53	x	0.4	x	0.8	=	11.49	(74)
North	0.9x	0.77	x	6.73	x	34.53	x	0.4	x	0.8	=	51.53	(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	1.5	x	55.46	x	0.4	x	0.8	=	18.45	(74)
North	0.9x	0.77	x	6.73	x	55.46	x	0.4	x	0.8	=	82.78	(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	1.5	x	74.72	x	0.4	x	0.8	=	24.85	(74)
North	0.9x	0.77	x	6.73	x	74.72	x	0.4	x	0.8	=	111.51	(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	1.5	x	79.99	x	0.4	x	0.8	=	26.61	(74)
North	0.9x	0.77	x	6.73	x	79.99	x	0.4	x	0.8	=	119.37	(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	1.5	x	74.68	x	0.4	x	0.8	=	24.84	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.4	x	0.8	=	111.45	(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	1.5	x	59.25	x	0.4	x	0.8	=	19.71	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.4	x	0.8	=	88.42	(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	1.5	x	41.52	x	0.4	x	0.8	=	13.81	(74)
North	0.9x	0.77	x	6.73	x	41.52	x	0.4	x	0.8	=	61.96	(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	1.5	x	24.19	x	0.4	x	0.8	=	8.05	(74)
North	0.9x	0.77	x	6.73	x	24.19	x	0.4	x	0.8	=	36.1	(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	1.5	x	13.12	x	0.4	x	0.8	=	4.36	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.4	x	0.8	=	19.58	(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	1.5	x	8.86	x	0.4	x	0.8	=	2.95	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.4	x	0.8	=	13.23	(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	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(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	2.24	x	110.23	x	0.4	x	0.8	=	54.76	(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	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(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	2.24	x	104.89	x	0.4	x	0.8	=	52.11	(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	2.24	x	82.59	x	0.4	x	0.8	=	41.02	(78)

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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	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)

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

(83)m=	47.91	85.22	128.62	183.54	230.54	240.63	227.04	189.67	147.01	97.19	57.98	40.65	(83)

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

(84)m=	450.41	485.73	516.56	551.22	577.71	567.96	541.44	509.76	477.47	448.11	432.43	432.67	(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	0.84	0.65	0.45	0.32	0.36	0.58	0.87	0.98	0.99	(86)

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

(87)m=	20.64	20.72	20.84	20.96	21	21	21	21	21	20.95	20.79	20.62	(87)

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

(88)m=	20.45	20.45	20.45	20.46	20.46	20.47	20.47	20.47	20.47	20.46	20.46	20.46	(88)

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

(89)m=	0.99	0.98	0.94	0.82	0.61	0.41	0.29	0.32	0.54	0.84	0.97	0.99	(89)

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

(90)m=	19.97	20.09	20.26	20.42	20.46	20.47	20.47	20.47	20.47	20.42	20.19	19.95	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	20.22	20.33	20.48	20.63	20.66	20.67	20.67	20.67	20.67	20.62	20.42	20.2	(92)

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

(93)m=	20.22	20.33	20.48	20.63	20.66	20.67	20.67	20.67	20.67	20.62	20.42	20.2	(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	0.63	0.43	0.3	0.33	0.55	0.85	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	445.95	475.58	487.68	455.62	362.24	242.65	162.77	170.24	263.82	382.57	420.6	429.43	(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=	663.65	641.1	579.08	477.84	364.15	242.7	162.78	170.25	264.3	407.1	544.61	658.56	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	161.97	111.23	68	16	1.42	0	0	0	0	18.25	89.29	170.48	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 636.63 (98)

Space heating requirement in kWh/m²/year 8.81 (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		636.63	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	700.3	(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		2048.64	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2253.51	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	29.54	(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		151.93	(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) =	151.93	(331)
Energy for lighting (calculated in Appendix L)		321.08	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-612.31	(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	=	480.57	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	15.33	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	495.9	(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) =			495.9	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	78.85	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	166.64	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-317.79	(380)
Total CO2, kg/year	sum of (376)…(382) =			423.61	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			5.86	(384)
EI rating (section 14)				95.16	(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: GT 304

Address : GT 304, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	72.3	(1a)	x	2.6	(2a)	=	187.98	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.3	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			187.98	(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			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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	0.44	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × 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	0.58	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	0.58	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			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 3			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Windows Type 4			6.73	x1/[1/(1.4)+ 0.04]		=	8.92			(27)
Walls	33.88	12.71	21.17	x	0.18	=	3.81			(29)
Roof	14.9	0	14.9	x	0.13	=	1.94			(30)
Total area of elements, m²			48.78							(31)
Party wall			54.18	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) = 22.6 (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 4.95 (36)

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

Total fabric heat loss (33) + (36) = 27.55 (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=	37.13	36.89	36.66	35.57	35.36	34.41	34.41	34.23	34.78	35.36	35.77	36.21	(38)

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

(39)m=	64.68	64.44	64.21	63.11	62.91	61.96	61.96	61.78	62.32	62.91	63.32	63.75	

Average = Sum(39)$_{1\ldots12}$ /12= 63.11 (39)

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

(40)m=	0.89	0.89	0.89	0.87	0.87	0.86	0.86	0.85	0.86	0.87	0.88	0.88

Average = Sum(40)$_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.3 (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 88.84 (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=	97.72	94.17	90.62	87.06	83.51	79.96	79.96	83.51	87.06	90.62	94.17	97.72

Total = Sum(44)$_{1...12}$ = 1066.08 (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=	144.92	126.75	130.79	114.03	109.41	94.42	87.49	100.4	101.6	118.4	129.24	140.35

Total = Sum(45)$_{1...12}$ = 1397.8 (45)

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

(46)m=	21.74	19.01	19.62	17.1	16.41	14.16	13.12	15.06	15.24	17.76	19.39	21.05	(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=	191.52	168.84	177.39	159.12	156.01	139.51	134.09	146.99	146.69	165	174.33	186.94	(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=	191.52	168.84	177.39	159.12	156.01	139.51	134.09	146.99	146.69	165	174.33	186.94	

Output from water heater (annual)$_{1...12}$ 1946.42 (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=	85.46	75.81	80.77	73.99	73.66	67.47	66.37	70.66	69.85	76.64	79.05	83.94	(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=	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	115.03	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18.52	16.45	13.38	10.13	7.57	6.39	6.91	8.98	12.05	15.3	17.86	19.03	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	202.6	204.71	199.41	188.13	173.89	160.51	151.57	149.47	154.77	166.05	180.28	193.67	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	(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=	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	(71)
Water heating gains (Table 5)													
(72)m=	114.87	112.82	108.56	102.76	99	93.7	89.2	94.97	97.02	103.02	109.79	112.83	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	396.5	394.48	381.85	361.53	340.97	321.12	308.19	313.93	324.35	344.87	368.44	386.03	(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)	
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	1.5	x	10.63	x	0.63	x	0.7	=	4.87	(74)
North	0.9x	0.77	x	6.73	x	10.63	x	0.63	x	0.7	=	21.87	(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	1.5	x	20.32	x	0.63	x	0.7	=	9.32	(74)

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North	0.9x	0.77	x	6.73	x	20.32	x	0.63	x	0.7	=	41.8	(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	1.5	x	34.53	x	0.63	x	0.7	=	15.83	(74)
North	0.9x	0.77	x	6.73	x	34.53	x	0.63	x	0.7	=	71.02	(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	1.5	x	55.46	x	0.63	x	0.7	=	25.43	(74)
North	0.9x	0.77	x	6.73	x	55.46	x	0.63	x	0.7	=	114.08	(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	1.5	x	74.72	x	0.63	x	0.7	=	34.25	(74)
North	0.9x	0.77	x	6.73	x	74.72	x	0.63	x	0.7	=	153.67	(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	1.5	x	79.99	x	0.63	x	0.7	=	36.67	(74)
North	0.9x	0.77	x	6.73	x	79.99	x	0.63	x	0.7	=	164.51	(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	1.5	x	74.68	x	0.63	x	0.7	=	34.23	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.63	x	0.7	=	153.59	(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	1.5	x	59.25	x	0.63	x	0.7	=	27.16	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.63	x	0.7	=	121.86	(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	1.5	x	41.52	x	0.63	x	0.7	=	19.03	(74)
North	0.9x	0.77	x	6.73	x	41.52	x	0.63	x	0.7	=	85.39	(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	1.5	x	24.19	x	0.63	x	0.7	=	11.09	(74)
North	0.9x	0.77	x	6.73	x	24.19	x	0.63	x	0.7	=	49.75	(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	1.5	x	13.12	x	0.63	x	0.7	=	6.01	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.63	x	0.7	=	26.98	(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	1.5	x	8.86	x	0.63	x	0.7	=	4.06	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.63	x	0.7	=	18.23	(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	2.24	x	76.57	x	0.63	x	0.7	=	52.42	(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	2.24	x	110.23	x	0.63	x	0.7	=	75.46	(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	2.24	x	110.55	x	0.63	x	0.7	=	75.68	(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	2.24	x	104.89	x	0.63	x	0.7	=	71.81	(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	2.24	x	82.59	x	0.63	x	0.7	=	56.54	(78)

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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	2.24	x	40.4	x	0.63	x	0.7	=	27.66	(78)

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

(83)m=	66.03	117.44	177.26	252.94	317.71	331.61	312.89	261.38	202.59	133.94	79.91	56.02	(83)

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

(84)m=	462.53	511.92	559.11	614.47	658.68	652.73	621.08	575.31	526.94	478.81	448.35	442.05	(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	0.81	0.6	0.44	0.49	0.76	0.96	0.99	1	(86)

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

(87)m=	20.16	20.28	20.48	20.74	20.93	20.99	21	21	20.96	20.73	20.41	20.14	(87)

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

(88)m=	20.17	20.17	20.18	20.19	20.19	20.2	20.2	20.21	20.2	20.19	20.19	20.18	(88)

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

(89)m=	1	0.99	0.98	0.92	0.76	0.53	0.36	0.41	0.69	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=	19.04	19.22	19.51	19.89	20.12	20.2	20.2	20.21	20.17	19.89	19.42	19.03	(90)

fLA = Living area ÷ (4) = | 0.38 | (91)

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

(92)m=	19.47	19.62	19.88	20.22	20.43	20.5	20.51	20.51	20.47	20.21	19.79	19.45	(92)

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

(93)m=	19.47	19.62	19.88	20.22	20.43	20.5	20.51	20.51	20.47	20.21	19.79	19.45	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.97	0.92	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	460.17	506.7	544.94	564.6	509.85	361.56	241.67	252.98	378.67	450.93	443.22	440.3	(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=	980.91	948.84	859.18	714.22	549.17	365.54	242.02	253.72	397.1	604.46	803.76	972.24	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	387.43	297.12	233.8	107.73	29.25	0	0	0	0	114.23	259.59	395.76	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = | 1824.91 | (98)

Space heating requirement in kWh/m²/year | 25.24 | (99)

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

Space heating:

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

TER WorkSheet: New dwelling design stage

Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		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)	387.43	297.12	233.8	107.73	29.25	0	0	0	0	114.23	259.59	395.76		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	414.37	317.77	250.05	115.22	31.28	0	0	0	0	122.17	277.64	423.27		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1951.77	(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)	191.52	168.84	177.39	159.12	156.01	139.51	134.09	146.99	146.69	165	174.33	186.94		
Efficiency of water heater													79.8	(216)
(217)m=	86.66	86.31	85.55	83.8	81.32	79.8	79.8	79.8	79.8	83.86	85.87	86.77		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	221.01	195.62	207.35	189.88	191.85	174.82	168.03	184.2	183.82	196.76	203.01	215.45		
Total = Sum(219a)$_{1...12}$ =													2331.81	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1951.77	
Water heating fuel used			2331.81	
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			327.07	(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	=	421.58	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	503.67	(264)
Space and water heating	(261) + (262) + (263) + (264) =				925.25	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	169.75	(268)

TER WorkSheet: New dwelling design stage

Total CO2, kg/year	sum of (265)…(271) =	1133.93	(272)
TER =		22.72	(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 17:35:11

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.4m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 305

Address : GT 305, 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)	25.8 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	7.50 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.6 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	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):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	4.47m²
Windows facing: North	4.48m²
Windows facing: North	1.7m²
Windows facing: North	3.28m²
Windows facing: North	2.24m²
Windows facing: South	2.24m²
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: GT 305

Address : GT 305, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76.4	(1a) x	2.6	(2a) =	198.64	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	198.64	(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			4.47	x1/[1/(1.4)+ 0.04]		=	5.93			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 3			1.7	x1/[1/(1.4)+ 0.04]		=	2.25			(27)
Windows Type 4			3.28	x1/[1/(1.4)+ 0.04]		=	4.35			(27)
Windows Type 5			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 6			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Walls	61.91	18.41	43.5	x	0.12	=	5.22			(29)
Roof	76.4	0	76.4	x	0.1	=	7.64			(30)
Total area of elements, m²			138.31							(31)
Party wall			42.77	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) = 37.27 (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 9.79 (36)

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

Total fabric heat loss (33) + (36) = 47.06 (37)

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

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

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(38)m=	14.81	14.67	14.53	13.83	13.69	13	13	12.86	13.27	13.69	13.97	14.25	(38)

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

(39)m=	61.86	61.72	61.58	60.89	60.75	60.05	60.05	59.91	60.33	60.75	61.03	61.31

Average = Sum(39)$_{1...12}$ /12= 60.85 (39)

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

(40)m=	0.81	0.81	0.81	0.8	0.8	0.79	0.79	0.78	0.79	0.8	0.8	0.8

Average = Sum(40)$_{1...12}$ /12= 0.8 (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 2.39 (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 90.99 (43)

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

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=	100.09	96.45	92.81	89.17	85.53	81.89	81.89	85.53	89.17	92.81	96.45	100.09

Total = Sum(44)$_{1...12}$ = 1091.84 (44)

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

(45)m=	148.42	129.81	133.95	116.78	112.06	96.7	89.6	102.82	104.05	121.26	132.37	143.74

Total = Sum(45)$_{1...12}$ = 1431.57 (45)

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

(46)m=	22.26	19.47	20.09	17.52	16.81	14.5	13.44	15.42	15.61	18.19	19.85	21.56	(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=	203.7	179.74	189.23	170.28	167.33	150.19	144.88	158.1	157.54	176.54	185.86	199.02	(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=	203.7	179.74	189.23	170.28	167.33	150.19	144.88	158.1	157.54	176.54	185.86	199.02

Output from water heater (annual)$_{1...12}$ | 2082.41 | (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=	93.57	83.1	88.76	81.63	81.48	74.95	74.01	78.41	77.39	84.54	86.81	92.01	(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=	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	(66)

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

(67)m=	18.88	16.77	13.64	10.32	7.72	6.51	7.04	9.15	12.28	15.59	18.2	19.4	(67)

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

(68)m=	211.75	213.95	208.41	196.62	181.74	167.76	158.42	156.22	161.76	173.54	188.42	202.41	(68)

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

(69)m=	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	(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=	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	(71)

Water heating gains (Table 5)

(72)m=	125.77	123.67	119.3	113.37	109.52	104.09	99.48	105.39	107.49	113.63	120.56	123.68	(72)

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

(73)m=	415.26	413.25	400.22	379.18	357.84	337.23	323.8	329.62	340.39	361.63	386.05	404.35	(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	0.4	x	0.8	=	10.56	(74)
North	0.9x	0.77	x	1.7	x	10.63	x	0.4	x	0.8	=	4.01	(74)

North	0.9x	0.77	x	3.28	x	10.63	x	0.4	x	0.8	=	7.73	(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	2.24	x	20.32	x	0.4	x	0.8	=	20.19	(74)
North	0.9x	0.77	x	1.7	x	20.32	x	0.4	x	0.8	=	7.66	(74)
North	0.9x	0.77	x	3.28	x	20.32	x	0.4	x	0.8	=	14.78	(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	2.24	x	34.53	x	0.4	x	0.8	=	34.31	(74)
North	0.9x	0.77	x	1.7	x	34.53	x	0.4	x	0.8	=	13.02	(74)
North	0.9x	0.77	x	3.28	x	34.53	x	0.4	x	0.8	=	25.12	(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	2.24	x	55.46	x	0.4	x	0.8	=	55.1	(74)
North	0.9x	0.77	x	1.7	x	55.46	x	0.4	x	0.8	=	20.91	(74)
North	0.9x	0.77	x	3.28	x	55.46	x	0.4	x	0.8	=	40.34	(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	2.24	x	74.72	x	0.4	x	0.8	=	74.23	(74)
North	0.9x	0.77	x	1.7	x	74.72	x	0.4	x	0.8	=	28.17	(74)
North	0.9x	0.77	x	3.28	x	74.72	x	0.4	x	0.8	=	54.35	(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	2.24	x	79.99	x	0.4	x	0.8	=	79.46	(74)
North	0.9x	0.77	x	1.7	x	79.99	x	0.4	x	0.8	=	30.15	(74)
North	0.9x	0.77	x	3.28	x	79.99	x	0.4	x	0.8	=	58.18	(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	2.24	x	74.68	x	0.4	x	0.8	=	74.19	(74)
North	0.9x	0.77	x	1.7	x	74.68	x	0.4	x	0.8	=	28.15	(74)
North	0.9x	0.77	x	3.28	x	74.68	x	0.4	x	0.8	=	54.32	(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	2.24	x	59.25	x	0.4	x	0.8	=	58.86	(74)
North	0.9x	0.77	x	1.7	x	59.25	x	0.4	x	0.8	=	22.34	(74)
North	0.9x	0.77	x	3.28	x	59.25	x	0.4	x	0.8	=	43.09	(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	2.24	x	41.52	x	0.4	x	0.8	=	41.25	(74)
North	0.9x	0.77	x	1.7	x	41.52	x	0.4	x	0.8	=	15.65	(74)
North	0.9x	0.77	x	3.28	x	41.52	x	0.4	x	0.8	=	30.2	(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	2.24	x	24.19	x	0.4	x	0.8	=	24.03	(74)
North	0.9x	0.77	x	1.7	x	24.19	x	0.4	x	0.8	=	9.12	(74)
North	0.9x	0.77	x	3.28	x	24.19	x	0.4	x	0.8	=	17.59	(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	2.24	x	13.12	x	0.4	x	0.8	=	13.03	(74)
North	0.9x	0.77	x	1.7	x	13.12	x	0.4	x	0.8	=	4.95	(74)
North	0.9x	0.77	x	3.28	x	13.12	x	0.4	x	0.8	=	9.54	(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	2.24	x	8.86	x	0.4	x	0.8	=	8.81	(74)
North	0.9x	0.77	x	1.7	x	8.86	x	0.4	x	0.8	=	3.34	(74)
North	0.9x	0.77	x	3.28	x	8.86	x	0.4	x	0.8	=	6.45	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
South	0.9x	0.77	x	4.47	x	46.75	x	0.4	x	0.8	=	46.34	(78)
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	4.47	x	76.57	x	0.4	x	0.8	=	75.9	(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	4.47	x	97.53	x	0.4	x	0.8	=	96.68	(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	4.47	x	110.23	x	0.4	x	0.8	=	109.27	(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	4.47	x	114.87	x	0.4	x	0.8	=	113.87	(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	4.47	x	110.55	x	0.4	x	0.8	=	109.58	(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	4.47	x	108.01	x	0.4	x	0.8	=	107.07	(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	4.47	x	104.89	x	0.4	x	0.8	=	103.98	(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	4.47	x	101.89	x	0.4	x	0.8	=	101	(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	4.47	x	82.59	x	0.4	x	0.8	=	81.86	(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	4.47	x	55.42	x	0.4	x	0.8	=	54.93	(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	4.47	x	40.4	x	0.4	x	0.8	=	40.05	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)

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

(83)m=	97.16	166.66	234.72	307.94	364.79	372.03	354.48	309.8	259.33	185.65	116.5	83.11	(83)

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

(84)m=	512.42	579.91	634.94	687.12	722.63	709.26	678.28	639.43	599.72	547.28	502.55	487.47	(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	0.97	0.9	0.74	0.54	0.39	0.43	0.68	0.93	0.99	1	(86)

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

(87)m=	20.31	20.45	20.64	20.84	20.96	21	21	21	20.99	20.84	20.54	20.29	(87)

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

(88)m=	20.24	20.25	20.25	20.26	20.26	20.27	20.27	20.27	20.26	20.26	20.25	20.25	(88)

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

(89)m=	0.99	0.99	0.96	0.87	0.7	0.48	0.32	0.36	0.61	0.9	0.98	1	(89)

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

(90)m=	19.33	19.52	19.79	20.08	20.23	20.26	20.27	20.27	20.25	20.08	19.66	19.29	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.71	19.88	20.11	20.37	20.51	20.54	20.55	20.55	20.53	20.37	20	19.67	(92)

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

(93)m=	19.71	19.88	20.11	20.37	20.51	20.54	20.55	20.55	20.53	20.37	20	19.67	(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	0.88	0.71	0.5	0.35	0.39	0.64	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	508.72	570.28	608.19	604.01	515.31	355.35	236.85	248.22	380.92	495.02	493.67	484.84	(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=	953.05	924.5	838.44	698.59	535.07	356.92	236.96	248.44	388.06	593.31	787.04	948.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	330.58	238.03	171.31	68.1	14.7	0	0	0	0	73.13	211.23	344.99	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1452.07 (98)

Space heating requirement in kWh/m²/year 19.01 (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		1452.07	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1597.27	(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		2082.41	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2290.65	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.88	(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		160.55	(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) =	160.55	(331)
Energy for lighting (calculated in Appendix L)		333.39	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-647.71	(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	=	632.55	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	20.18	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	652.73	(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) =				652.73	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	83.33	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	173.03	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52		x 0.01 =	-336.16	(380)
Total CO2, kg/year	sum of (376)…(382) =				572.92	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				7.5	(384)
EI rating (section 14)					93.68	(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: GT 305

Address : GT 305, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76.4	(1a) x	2.6	(2a) =	198.64	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	198.64	(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	0.43	0.42	0.37	0.37	0.32	0.32	0.32	0.34	0.37	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			4.47		x1/[1/(1.4)+ 0.04]	=	5.93			(27)
Windows Type 2			2.24		x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 3			1.7		x1/[1/(1.4)+ 0.04]	=	2.25			(27)
Windows Type 4			3.28		x1/[1/(1.4)+ 0.04]	=	4.35			(27)
Windows Type 5			2.24		x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 6			2.24		x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Walls	61.91	18.41	43.5	x	0.18	=	7.83			(29)
Roof	76.4	0	76.4	x	0.13	=	9.93			(30)
Total area of elements, m²			138.31							(31)
Party wall			42.77	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) = 42.17 (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 7.27 (36)

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

Total fabric heat loss (33) + (36) = 49.44 (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=	38.97	38.73	38.49	37.38	37.18	36.21	36.21	36.03	36.58	37.18	37.6	38.03	(38)

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

(39)m=	88.4	88.16	87.93	86.82	86.61	85.65	85.65	85.47	86.02	86.61	87.03	87.47	

Average = $Sum(39)_{1...12}$ /12= 86.82 (39)

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

(40)m=	1.16	1.15	1.15	1.14	1.13	1.12	1.12	1.12	1.13	1.13	1.14	1.14	

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 2.39 (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 90.99 (43)

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

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=	100.09	96.45	92.81	89.17	85.53	81.89	81.89	85.53	89.17	92.81	96.45	100.09

Total = $Sum(44)_{1...12}$ = 1091.84 (44)

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

(45)m=	148.42	129.81	133.95	116.78	112.06	96.7	89.6	102.82	104.05	121.26	132.37	143.74

Total = $Sum(45)_{1...12}$ = 1431.57 (45)

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

(46)m=	22.26	19.47	20.09	17.52	16.81	14.5	13.44	15.42	15.61	18.19	19.85	21.56	(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=	195.02	171.9	180.55	161.88	158.65	141.79	136.2	149.42	149.14	167.86	177.46	190.33	(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=	195.02	171.9	180.55	161.88	158.65	141.79	136.2	149.42	149.14	167.86	177.46	190.33

Output from water heater (annual)$_{1...12}$ | 1980.19 | (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=	86.63	76.83	81.82	74.9	74.54	68.23	67.07	71.46	70.67	77.59	80.08	85.07	(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=	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	119.55	(66)

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

(67)m=	18.88	16.77	13.64	10.32	7.72	6.51	7.04	9.15	12.28	15.59	18.2	19.4	(67)

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

(68)m=	211.75	213.95	208.41	196.62	181.74	167.76	158.42	156.22	161.76	173.54	188.42	202.41	(68)

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

(69)m=	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	34.96	(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=	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	-95.64	(71)

Water heating gains (Table 5)

(72)m=	116.43	114.33	109.97	104.03	100.18	94.76	90.15	96.05	98.15	104.29	111.23	114.34	(72)

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

(73)m=	408.93	406.91	393.88	372.85	351.51	330.9	317.47	323.29	334.06	355.3	379.72	398.02	(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)	
North	0.9x	0.77	x	2.24	x	10.63	x	0.63	x	0.7	=	14.56	(74)
North	0.9x	0.77	x	1.7	x	10.63	x	0.63	x	0.7	=	5.52	(74)

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North	0.9x	0.77	x	3.28	x	10.63	x	0.63	x	0.7	=	10.66	(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	2.24	x	20.32	x	0.63	x	0.7	=	27.82	(74)
North	0.9x	0.77	x	1.7	x	20.32	x	0.63	x	0.7	=	10.56	(74)
North	0.9x	0.77	x	3.28	x	20.32	x	0.63	x	0.7	=	20.37	(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	2.24	x	34.53	x	0.63	x	0.7	=	47.28	(74)
North	0.9x	0.77	x	1.7	x	34.53	x	0.63	x	0.7	=	17.94	(74)
North	0.9x	0.77	x	3.28	x	34.53	x	0.63	x	0.7	=	34.61	(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	2.24	x	55.46	x	0.63	x	0.7	=	75.94	(74)
North	0.9x	0.77	x	1.7	x	55.46	x	0.63	x	0.7	=	28.82	(74)
North	0.9x	0.77	x	3.28	x	55.46	x	0.63	x	0.7	=	55.6	(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	2.24	x	74.72	x	0.63	x	0.7	=	102.3	(74)
North	0.9x	0.77	x	1.7	x	74.72	x	0.63	x	0.7	=	38.82	(74)
North	0.9x	0.77	x	3.28	x	74.72	x	0.63	x	0.7	=	74.9	(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	2.24	x	79.99	x	0.63	x	0.7	=	109.51	(74)
North	0.9x	0.77	x	1.7	x	79.99	x	0.63	x	0.7	=	41.56	(74)
North	0.9x	0.77	x	3.28	x	79.99	x	0.63	x	0.7	=	80.18	(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	2.24	x	74.68	x	0.63	x	0.7	=	102.24	(74)
North	0.9x	0.77	x	1.7	x	74.68	x	0.63	x	0.7	=	38.8	(74)
North	0.9x	0.77	x	3.28	x	74.68	x	0.63	x	0.7	=	74.86	(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	2.24	x	59.25	x	0.63	x	0.7	=	81.12	(74)
North	0.9x	0.77	x	1.7	x	59.25	x	0.63	x	0.7	=	30.78	(74)
North	0.9x	0.77	x	3.28	x	59.25	x	0.63	x	0.7	=	59.39	(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	2.24	x	41.52	x	0.63	x	0.7	=	56.84	(74)
North	0.9x	0.77	x	1.7	x	41.52	x	0.63	x	0.7	=	21.57	(74)
North	0.9x	0.77	x	3.28	x	41.52	x	0.63	x	0.7	=	41.62	(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	2.24	x	24.19	x	0.63	x	0.7	=	33.12	(74)
North	0.9x	0.77	x	1.7	x	24.19	x	0.63	x	0.7	=	12.57	(74)
North	0.9x	0.77	x	3.28	x	24.19	x	0.63	x	0.7	=	24.25	(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	2.24	x	13.12	x	0.63	x	0.7	=	17.96	(74)
North	0.9x	0.77	x	1.7	x	13.12	x	0.63	x	0.7	=	6.82	(74)
North	0.9x	0.77	x	3.28	x	13.12	x	0.63	x	0.7	=	13.15	(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	2.24	x	8.86	x	0.63	x	0.7	=	12.14	(74)
North	0.9x	0.77	x	1.7	x	8.86	x	0.63	x	0.7	=	4.61	(74)
North	0.9x	0.77	x	3.28	x	8.86	x	0.63	x	0.7	=	8.89	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.63	x	0.7	=	6.07	(74)
South	0.9x	0.77	x	4.47	x	46.75	x	0.63	x	0.7	=	63.87	(78)
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	4.47	x	76.57	x	0.63	x	0.7	=	104.6	(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	4.47	x	97.53	x	0.63	x	0.7	=	133.24	(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	4.47	x	110.23	x	0.63	x	0.7	=	150.59	(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	4.47	x	114.87	x	0.63	x	0.7	=	156.92	(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	4.47	x	110.55	x	0.63	x	0.7	=	151.02	(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	4.47	x	108.01	x	0.63	x	0.7	=	147.55	(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	4.47	x	104.89	x	0.63	x	0.7	=	143.3	(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	4.47	x	101.89	x	0.63	x	0.7	=	139.18	(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	4.47	x	82.59	x	0.63	x	0.7	=	112.82	(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	4.47	x	55.42	x	0.63	x	0.7	=	75.7	(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	4.47	x	40.4	x	0.63	x	0.7	=	55.19	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.63	x	0.7	=	27.66	(78)

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

(83)m=	133.89	229.68	323.48	424.38	502.72	512.7	488.51	426.95	357.38	255.85	160.55	114.54	(83)

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

(84)m=	542.82	636.59	717.36	797.22	854.23	843.59	805.98	750.24	691.44	611.15	540.27	512.56	(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	0.93	0.81	0.62	0.46	0.51	0.77	0.95	0.99	1	(86)

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

(87)m=	19.85	20.03	20.29	20.62	20.86	20.97	20.99	20.99	20.92	20.61	20.17	19.82	(87)

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

(88)m=	19.95	19.96	19.96	19.97	19.97	19.98	19.98	19.99	19.98	19.97	19.97	19.96	(88)

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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	0.54	0.36	0.41	0.68	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=	18.44	18.7	19.08	19.54	19.84	19.97	19.98	19.98	19.92	19.53	18.91	18.4	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	18.98	19.21	19.54	19.95	20.23	20.35	20.37	20.37	20.3	19.94	19.39	18.94	(92)

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

(93)m=	18.98	19.21	19.54	19.95	20.23	20.35	20.37	20.37	20.3	19.94	19.39	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

	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	0.9	0.77	0.57	0.4	0.45	0.71	0.93	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	538.76	626.18	690.29	719.19	657.54	479.07	321.04	335.98	492.88	567.3	531.72	509.6	(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=	1297.53	1261.44	1146.73	959.23	739	492.54	322.82	339.15	533.65	809.22	1069.77	1289.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	564.53	426.89	339.59	172.83	60.6	0	0	0	0	179.99	387.4	580.27	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2712.1 (98)

Space heating requirement in kWh/m²/year 35.5 (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)													
	564.53	426.89	339.59	172.83	60.6	0	0	0	0	179.99	387.4	580.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	603.77	456.57	363.2	184.85	64.82	0	0	0	0	192.5	414.33	620.61	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2900.64 (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)

195.02	171.9	180.55	161.88	158.65	141.79	136.2	149.42	149.14	167.86	177.46	190.33

Efficiency of water heater 79.8 (216)

(217)m=	87.49	87.15	86.48	84.99	82.5	79.8	79.8	79.8	79.8	85	86.84	87.6	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	222.91	197.25	208.79	190.47	192.32	177.68	170.68	187.24	186.89	197.48	204.35	217.28

Total = Sum(219a)$_{1...12}$ = 2353.32 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2900.64	
Water heating fuel used		2353.32	
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		333.39	(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	=	626.54	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	508.32	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1134.86	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	173.03	(268)
Total CO2, kg/year			sum of (265)…(271) =		1346.81	(272)

TER = 25.8 (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 17:35:22

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 75.8m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 306

Address : GT 306, 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)	28.64 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	8.70 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	48.2 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):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	2.47m²
Windows facing: North	2.24m²
Windows facing: North	2.24m²
Windows facing: North	6.73m²
Windows facing: North	2.24m²
Windows facing: East	2.24m²
Windows facing: South	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: GT 306

Address : GT 306, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	75.8	(1a)	x	2.6	(2a)	=	197.08	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	75.8	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			197.08	(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

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

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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	
Windows Type 1			2.47	x1/[1/(1.4)+ 0.04]	=	3.27			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 3			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 4			6.73	x1/[1/(1.4)+ 0.04]	=	8.92			(27)
Windows Type 5			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 6			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 7			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Walls	80.34	19.66	60.68	x 0.12	=	7.28			(29)
Roof	75.8	0	75.8	x 0.1	=	7.58			(30)
Total area of elements, m²			156.14						(31)
Party wall			27.72	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) = 40.93 (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 11.01 (36)

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

Total fabric heat loss (33) + (36) = 51.93 (37)

DER WorkSheet: New dwelling design stage

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=	15.31	15.16	15.01	14.26	14.11	13.36	13.36	13.21	13.66	14.11	14.41	14.71	(38)

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

(39)m=	67.25	67.1	66.95	66.19	66.04	65.29	65.29	65.14	65.59	66.04	66.34	66.64	

Average = $Sum(39)_{1...12}$ /12= 66.16 (39)

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

(40)m=	0.89	0.89	0.88	0.87	0.87	0.86	0.86	0.86	0.87	0.88	0.88	0.88	

Average = $Sum(40)_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (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 90.69 (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=	99.75	96.13	92.5	88.87	85.24	81.62	81.62	85.24	88.87	92.5	96.13	99.75	

Total = $Sum(44)_{1...12}$ = 1088.23 (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=	147.93	129.38	133.51	116.4	111.69	96.38	89.31	102.48	103.71	120.86	131.93	143.26	

Total = $Sum(45)_{1...12}$ = 1426.84 (45)

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

(46)m=	22.19	19.41	20.03	17.46	16.75	14.46	13.4	15.37	15.56	18.13	19.79	21.49	(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=	203.21	179.31	188.79	169.89	166.96	149.87	144.58	157.76	157.2	176.14	185.42	198.54	(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=	203.21	179.31	188.79	169.89	166.96	149.87	144.58	157.76	157.2	176.14	185.42	198.54

Output from water heater (annual)$_{1\ldots12}$ — 2077.68 (64)

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

(65)m=	93.41	82.96	88.61	81.5	81.36	74.84	73.92	78.3	77.28	84.41	86.66	91.86	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	(66)

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

(67)m=	18.76	16.66	13.55	10.26	7.67	6.47	7	9.09	12.21	15.5	18.09	19.28	(67)

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

(68)m=	210.44	212.62	207.12	195.41	180.62	166.72	157.43	155.25	160.75	172.47	187.26	201.15	(68)

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

(69)m=	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	(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=	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	(71)

Water heating gains (Table 5)

(72)m=	125.55	123.45	119.1	113.19	109.35	103.95	99.35	105.24	107.33	113.45	120.36	123.46	(72)

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

(73)m=	413.43	411.42	398.45	377.53	356.31	335.81	322.45	328.26	338.96	360.09	384.38	402.58	(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)

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North	0.9x	0.77	x	2.47	x	10.63	x	0.4	x	0.8	=	5.82	(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	2.24	x	10.63	x	0.4	x	0.8	=	5.28	(74)
North	0.9x	0.77	x	6.73	x	10.63	x	0.4	x	0.8	=	15.87	(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	2.47	x	20.32	x	0.4	x	0.8	=	11.13	(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	2.24	x	20.32	x	0.4	x	0.8	=	10.09	(74)
North	0.9x	0.77	x	6.73	x	20.32	x	0.4	x	0.8	=	30.33	(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	2.47	x	34.53	x	0.4	x	0.8	=	18.91	(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	2.24	x	34.53	x	0.4	x	0.8	=	17.15	(74)
North	0.9x	0.77	x	6.73	x	34.53	x	0.4	x	0.8	=	51.53	(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	2.47	x	55.46	x	0.4	x	0.8	=	30.38	(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	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(74)
North	0.9x	0.77	x	6.73	x	55.46	x	0.4	x	0.8	=	82.78	(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	2.47	x	74.72	x	0.4	x	0.8	=	40.93	(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	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	x	6.73	x	74.72	x	0.4	x	0.8	=	111.51	(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	2.47	x	79.99	x	0.4	x	0.8	=	43.81	(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	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	6.73	x	79.99	x	0.4	x	0.8	=	119.37	(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	2.47	x	74.68	x	0.4	x	0.8	=	40.9	(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	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.4	x	0.8	=	111.45	(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	2.47	x	59.25	x	0.4	x	0.8	=	32.45	(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	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.4	x	0.8	=	88.42	(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	2.47	x	41.52	x	0.4	x	0.8	=	22.74	(74)

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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	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	x	6.73	x	41.52	x	0.4	x	0.8	=	61.96	(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	2.47	x	24.19	x	0.4	x	0.8	=	13.25	(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	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	x	6.73	x	24.19	x	0.4	x	0.8	=	36.1	(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	2.47	x	13.12	x	0.4	x	0.8	=	7.19	(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	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.4	x	0.8	=	19.58	(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	2.47	x	8.86	x	0.4	x	0.8	=	4.86	(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	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.4	x	0.8	=	13.23	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
East	0.9x	0.77	x	2.24	x	19.64	x	0.4	x	0.8	=	9.76	(76)
East	0.9x	0.77	x	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(76)
East	0.9x	0.77	x	2.24	x	63.27	x	0.4	x	0.8	=	31.43	(76)
East	0.9x	0.77	x	2.24	x	92.28	x	0.4	x	0.8	=	45.84	(76)
East	0.9x	0.77	x	2.24	x	113.09	x	0.4	x	0.8	=	56.18	(76)
East	0.9x	0.77	x	2.24	x	115.77	x	0.4	x	0.8	=	57.51	(76)
East	0.9x	0.77	x	2.24	x	110.22	x	0.4	x	0.8	=	54.75	(76)
East	0.9x	0.77	x	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(76)
East	0.9x	0.77	x	2.24	x	73.59	x	0.4	x	0.8	=	36.55	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(76)
East	0.9x	0.77	x	2.24	x	16.15	x	0.4	x	0.8	=	8.02	(76)
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	1.5	x	76.57	x	0.4	x	0.8	=	25.47	(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	1.5	x	110.23	x	0.4	x	0.8	=	36.67	(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	1.5	x	110.55	x	0.4	x	0.8	=	36.77	(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	1.5	x	104.89	x	0.4	x	0.8	=	34.89	(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	1.5	x	82.59	x	0.4	x	0.8	=	27.47	(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	1.5	x	40.4	x	0.4	x	0.8	=	13.44	(78)

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

(83)m=	62.85	116.3	185.78	278.32	358.17	376.66	354.32	291.09	217.02	135.52	76.91	52.76	(83)

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

(84)m=	476.27	527.71	584.23	655.85	714.48	712.48	676.77	619.34	555.98	495.61	461.29	455.33	(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	0.99	0.98	0.93	0.79	0.58	0.42	0.48	0.76	0.96	0.99	1	(86)

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

(87)m=	20.16	20.28	20.48	20.75	20.94	20.99	21	21	20.96	20.73	20.39	20.13	(87)

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

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

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

(89)m=	1	0.99	0.98	0.91	0.74	0.51	0.35	0.4	0.69	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=	19.05	19.22	19.52	19.91	20.13	20.2	20.2	20.2	20.17	19.88	19.4	19.02	(90)

fLA = Living area ÷ (4) = 0.39 (91)

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

(92)m=	19.48	19.63	19.9	20.24	20.44	20.51	20.51	20.51	20.48	20.21	19.79	19.45	(92)

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

(93)m=	19.48	19.63	19.9	20.24	20.44	20.51	20.51	20.51	20.48	20.21	19.79	19.45	(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	0.91	0.76	0.54	0.38	0.43	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	474.05	522.73	569.55	599.33	540.91	382.02	255.04	267.1	398.88	468.31	456.49	453.69	(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=	1020.76	988.56	896.89	750.35	577.51	385.59	255.36	267.82	418.28	634.44	841.85	1016.48	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	406.75	313.03	243.55	108.73	27.23	0	0	0	0	123.6	277.46	418.72	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1919.07 (98)

Space heating requirement in kWh/m²/year 25.32 (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		1919.07	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2110.98	(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		2077.68	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2285.45	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	43.96	(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		159.29	(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) =	159.29	(331)
Energy for lighting (calculated in Appendix L)		331.32	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-642.53	(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	=	715.28	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	22.82	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	738.1	(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) =			738.1	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	82.67	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	171.96	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-333.47	(380)
Total CO2, kg/year	sum of (376)…(382) =			659.25	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			8.7	(384)
EI rating (section 14)				92.69	(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: GT 306

Address : GT 306, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	75.8	(1a)	x	2.6	(2a)	=	197.08	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	75.8	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			197.08	(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) =	0.15	(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		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

0.47	0.47	0.46	0.41	0.4	0.35	0.35	0.34	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	0.6	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	0.6	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			2.38		x1/[1/(1.4)+ 0.04]	=	3.16			(27)
Windows Type 2			2.16		x1/[1/(1.4)+ 0.04]	=	2.86			(27)
Windows Type 3			2.16		x1/[1/(1.4)+ 0.04]	=	2.86			(27)
Windows Type 4			6.49		x1/[1/(1.4)+ 0.04]	=	8.6			(27)
Windows Type 5			2.16		x1/[1/(1.4)+ 0.04]	=	2.86			(27)
Windows Type 6			2.16		x1/[1/(1.4)+ 0.04]	=	2.86			(27)
Windows Type 7			1.45		x1/[1/(1.4)+ 0.04]	=	1.92			(27)
Walls	80.34	18.96	61.38	x	0.18	=	11.05			(29)
Roof	75.8	0	75.8	x	0.13	=	9.85			(30)
Total area of elements, m²			156.14							(31)
Party wall			27.72	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) = 46.04 (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 8.6 (36)

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

Total fabric heat loss (33) + (36) = 54.63 (37)

TER WorkSheet: New dwelling design stage

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=	39.84	39.55	39.27	37.96	37.72	36.58	36.58	36.37	37.02	37.72	38.22	38.73	(38)

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

(39)m=	94.47	94.19	93.91	92.6	92.35	91.21	91.21	91	91.65	92.35	92.85	93.37	

Average = Sum(39)1…12 /12= 92.6 (39)

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

(40)m=	1.25	1.24	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.22	1.23	

Average = Sum(40)1…12 /12= 1.22 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (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 90.69 (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=	99.75	96.13	92.5	88.87	85.24	81.62	81.62	85.24	88.87	92.5	96.13	99.75	

Total = Sum(44)1…12 = 1088.23 (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=	147.93	129.38	133.51	116.4	111.69	96.38	89.31	102.48	103.71	120.86	131.93	143.26	

Total = Sum(45)1…12 = 1426.84 (45)

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

(46)m=	22.19	19.41	20.03	17.46	16.75	14.46	13.4	15.37	15.56	18.13	19.79	21.49	(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)

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

(57)m=	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=	194.53	171.47	180.11	161.49	158.28	141.47	135.9	149.08	148.8	167.45	177.02	189.86	(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=	194.53	171.47	180.11	161.49	158.28	141.47	135.9	149.08	148.8	167.45	177.02	189.86

Output from water heater (annual)$_{1...12}$ — 1975.46 — (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=	86.46	76.69	81.67	74.78	74.41	68.12	66.97	71.35	70.56	77.46	79.94	84.91	(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=	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	(66)

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

(67)m=	18.76	16.66	13.55	10.26	7.67	6.47	7	9.09	12.21	15.5	18.09	19.28	(67)

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

(68)m=	210.44	212.62	207.12	195.41	180.62	166.72	157.43	155.25	160.75	172.47	187.26	201.15	(68)

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

(69)m=	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	34.89	(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=	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	-95.13	(71)

Water heating gains (Table 5)

(72)m=	116.21	114.12	109.77	103.86	100.02	94.61	90.01	95.9	97.99	104.12	111.03	114.13	(72)

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

(73)m=	407.09	405.08	392.12	371.2	349.98	329.48	316.12	321.92	332.63	353.76	378.05	396.24	(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)

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North	0.9x	0.77	x	2.38	x	10.63	x	0.63	x	0.7	=	7.73	(74)
North	0.9x	0.77	x	2.16	x	10.63	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	2.16	x	10.63	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	6.49	x	10.63	x	0.63	x	0.7	=	21.09	(74)
North	0.9x	0.77	x	2.16	x	10.63	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	2.38	x	20.32	x	0.63	x	0.7	=	14.78	(74)
North	0.9x	0.77	x	2.16	x	20.32	x	0.63	x	0.7	=	13.41	(74)
North	0.9x	0.77	x	2.16	x	20.32	x	0.63	x	0.7	=	13.41	(74)
North	0.9x	0.77	x	6.49	x	20.32	x	0.63	x	0.7	=	40.31	(74)
North	0.9x	0.77	x	2.16	x	20.32	x	0.63	x	0.7	=	13.41	(74)
North	0.9x	0.77	x	2.38	x	34.53	x	0.63	x	0.7	=	25.12	(74)
North	0.9x	0.77	x	2.16	x	34.53	x	0.63	x	0.7	=	22.79	(74)
North	0.9x	0.77	x	2.16	x	34.53	x	0.63	x	0.7	=	22.79	(74)
North	0.9x	0.77	x	6.49	x	34.53	x	0.63	x	0.7	=	68.49	(74)
North	0.9x	0.77	x	2.16	x	34.53	x	0.63	x	0.7	=	22.79	(74)
North	0.9x	0.77	x	2.38	x	55.46	x	0.63	x	0.7	=	40.34	(74)
North	0.9x	0.77	x	2.16	x	55.46	x	0.63	x	0.7	=	36.61	(74)
North	0.9x	0.77	x	2.16	x	55.46	x	0.63	x	0.7	=	36.61	(74)
North	0.9x	0.77	x	6.49	x	55.46	x	0.63	x	0.7	=	110.01	(74)
North	0.9x	0.77	x	2.16	x	55.46	x	0.63	x	0.7	=	36.61	(74)
North	0.9x	0.77	x	2.38	x	74.72	x	0.63	x	0.7	=	54.35	(74)
North	0.9x	0.77	x	2.16	x	74.72	x	0.63	x	0.7	=	49.32	(74)
North	0.9x	0.77	x	2.16	x	74.72	x	0.63	x	0.7	=	49.32	(74)
North	0.9x	0.77	x	6.49	x	74.72	x	0.63	x	0.7	=	148.19	(74)
North	0.9x	0.77	x	2.16	x	74.72	x	0.63	x	0.7	=	49.32	(74)
North	0.9x	0.77	x	2.38	x	79.99	x	0.63	x	0.7	=	58.18	(74)
North	0.9x	0.77	x	2.16	x	79.99	x	0.63	x	0.7	=	52.8	(74)
North	0.9x	0.77	x	2.16	x	79.99	x	0.63	x	0.7	=	52.8	(74)
North	0.9x	0.77	x	6.49	x	79.99	x	0.63	x	0.7	=	158.65	(74)
North	0.9x	0.77	x	2.16	x	79.99	x	0.63	x	0.7	=	52.8	(74)
North	0.9x	0.77	x	2.38	x	74.68	x	0.63	x	0.7	=	54.32	(74)
North	0.9x	0.77	x	2.16	x	74.68	x	0.63	x	0.7	=	49.3	(74)
North	0.9x	0.77	x	2.16	x	74.68	x	0.63	x	0.7	=	49.3	(74)
North	0.9x	0.77	x	6.49	x	74.68	x	0.63	x	0.7	=	148.12	(74)
North	0.9x	0.77	x	2.16	x	74.68	x	0.63	x	0.7	=	49.3	(74)
North	0.9x	0.77	x	2.38	x	59.25	x	0.63	x	0.7	=	43.09	(74)
North	0.9x	0.77	x	2.16	x	59.25	x	0.63	x	0.7	=	39.11	(74)
North	0.9x	0.77	x	2.16	x	59.25	x	0.63	x	0.7	=	39.11	(74)
North	0.9x	0.77	x	6.49	x	59.25	x	0.63	x	0.7	=	117.51	(74)
North	0.9x	0.77	x	2.16	x	59.25	x	0.63	x	0.7	=	39.11	(74)
North	0.9x	0.77	x	2.38	x	41.52	x	0.63	x	0.7	=	30.2	(74)

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North	0.9x	0.77	x	2.16	x	41.52	x	0.63	x	0.7	=	27.41	(74)
North	0.9x	0.77	x	2.16	x	41.52	x	0.63	x	0.7	=	27.41	(74)
North	0.9x	0.77	x	6.49	x	41.52	x	0.63	x	0.7	=	82.35	(74)
North	0.9x	0.77	x	2.16	x	41.52	x	0.63	x	0.7	=	27.41	(74)
North	0.9x	0.77	x	2.38	x	24.19	x	0.63	x	0.7	=	17.59	(74)
North	0.9x	0.77	x	2.16	x	24.19	x	0.63	x	0.7	=	15.97	(74)
North	0.9x	0.77	x	2.16	x	24.19	x	0.63	x	0.7	=	15.97	(74)
North	0.9x	0.77	x	6.49	x	24.19	x	0.63	x	0.7	=	47.98	(74)
North	0.9x	0.77	x	2.16	x	24.19	x	0.63	x	0.7	=	15.97	(74)
North	0.9x	0.77	x	2.38	x	13.12	x	0.63	x	0.7	=	9.54	(74)
North	0.9x	0.77	x	2.16	x	13.12	x	0.63	x	0.7	=	8.66	(74)
North	0.9x	0.77	x	2.16	x	13.12	x	0.63	x	0.7	=	8.66	(74)
North	0.9x	0.77	x	6.49	x	13.12	x	0.63	x	0.7	=	26.02	(74)
North	0.9x	0.77	x	2.16	x	13.12	x	0.63	x	0.7	=	8.66	(74)
North	0.9x	0.77	x	2.38	x	8.86	x	0.63	x	0.7	=	6.45	(74)
North	0.9x	0.77	x	2.16	x	8.86	x	0.63	x	0.7	=	5.85	(74)
North	0.9x	0.77	x	2.16	x	8.86	x	0.63	x	0.7	=	5.85	(74)
North	0.9x	0.77	x	6.49	x	8.86	x	0.63	x	0.7	=	17.58	(74)
North	0.9x	0.77	x	2.16	x	8.86	x	0.63	x	0.7	=	5.85	(74)
East	0.9x	0.77	x	2.16	x	19.64	x	0.63	x	0.7	=	12.97	(76)
East	0.9x	0.77	x	2.16	x	38.42	x	0.63	x	0.7	=	25.36	(76)
East	0.9x	0.77	x	2.16	x	63.27	x	0.63	x	0.7	=	41.77	(76)
East	0.9x	0.77	x	2.16	x	92.28	x	0.63	x	0.7	=	60.92	(76)
East	0.9x	0.77	x	2.16	x	113.09	x	0.63	x	0.7	=	74.66	(76)
East	0.9x	0.77	x	2.16	x	115.77	x	0.63	x	0.7	=	76.42	(76)
East	0.9x	0.77	x	2.16	x	110.22	x	0.63	x	0.7	=	72.76	(76)
East	0.9x	0.77	x	2.16	x	94.68	x	0.63	x	0.7	=	62.5	(76)
East	0.9x	0.77	x	2.16	x	73.59	x	0.63	x	0.7	=	48.58	(76)
East	0.9x	0.77	x	2.16	x	45.59	x	0.63	x	0.7	=	30.09	(76)
East	0.9x	0.77	x	2.16	x	24.49	x	0.63	x	0.7	=	16.17	(76)
East	0.9x	0.77	x	2.16	x	16.15	x	0.63	x	0.7	=	10.66	(76)
South	0.9x	0.77	x	1.45	x	46.75	x	0.63	x	0.7	=	20.72	(78)
South	0.9x	0.77	x	1.45	x	76.57	x	0.63	x	0.7	=	33.93	(78)
South	0.9x	0.77	x	1.45	x	97.53	x	0.63	x	0.7	=	43.22	(78)
South	0.9x	0.77	x	1.45	x	110.23	x	0.63	x	0.7	=	48.85	(78)
South	0.9x	0.77	x	1.45	x	114.87	x	0.63	x	0.7	=	50.9	(78)
South	0.9x	0.77	x	1.45	x	110.55	x	0.63	x	0.7	=	48.99	(78)
South	0.9x	0.77	x	1.45	x	108.01	x	0.63	x	0.7	=	47.86	(78)
South	0.9x	0.77	x	1.45	x	104.89	x	0.63	x	0.7	=	46.48	(78)
South	0.9x	0.77	x	1.45	x	101.89	x	0.63	x	0.7	=	45.15	(78)
South	0.9x	0.77	x	1.45	x	82.59	x	0.63	x	0.7	=	36.6	(78)

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South	0.9x	0.77	x	1.45	x	55.42	x	0.63	x	0.7	=	24.56	(78)
South	0.9x	0.77	x	1.45	x	40.4	x	0.63	x	0.7	=	17.9	(78)

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

(83)m=	83.57	154.62	246.98	369.96	476.06	500.64	470.94	386.91	288.49	180.17	102.26	70.15	(83)

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

(84)m=	490.66	559.7	639.09	741.15	826.04	830.11	787.06	708.84	621.12	533.92	480.31	466.39	(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=	1	0.99	0.99	0.95	0.84	0.66	0.5	0.57	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=	19.67	19.83	20.11	20.49	20.8	20.96	20.99	20.98	20.86	20.46	20.01	19.65	(87)

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

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

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

(89)m=	1	0.99	0.98	0.93	0.79	0.57	0.38	0.45	0.76	0.96	0.99	1	(89)

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

(90)m=	18.13	18.36	18.76	19.31	19.72	19.89	19.91	19.91	19.8	19.28	18.63	18.11	(90)

fLA = Living area ÷ (4) = 0.39 (91)

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

(92)m=	18.73	18.93	19.29	19.77	20.14	20.3	20.33	20.33	20.21	19.74	19.16	18.71	(92)

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

(93)m=	18.73	18.93	19.29	19.77	20.14	20.3	20.33	20.33	20.21	19.74	19.16	18.71	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.98	0.93	0.8	0.6	0.43	0.5	0.78	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	488.11	554.1	623.6	686.81	663.03	498.74	337.15	351.07	486.5	510.51	475.47	464.47	(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=	1363.28	1321.54	1200.64	1006.55	779.37	520.32	340.51	357.58	560.44	844.19	1120.03	1354.58	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	651.13	515.72	429.32	230.22	86.55	0	0	0	0	248.26	464.08	662.24	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 3287.53 (98)

Space heating requirement in kWh/m²/year 43.37 (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)	651.13	515.72	429.32	230.22	86.55	0	0	0	0	248.26	464.08	662.24		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	696.39	551.58	459.17	246.22	92.57	0	0	0	0	265.52	496.34	708.28		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													3516.07	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)	194.53	171.47	180.11	161.49	158.28	141.47	135.9	149.08	148.8	167.45	177.02	189.86		
Efficiency of water heater													79.8	(216)
(217)m=	87.79	87.57	87.05	85.76	83.28	79.8	79.8	79.8	79.8	85.86	87.27	87.87		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	221.58	195.81	206.9	188.31	190.06	177.28	170.3	186.81	186.46	195.03	202.84	216.06		
Total = Sum(219a)$_{1...12}$ =													2337.44	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			3516.07	
Water heating fuel used			2337.44	
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			331.32	(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	=	759.47	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	504.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1264.36	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	171.96	(268)

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Total CO_2, kg/year	sum of (265)…(271) =	1475.24	(272)
TER =		28.64	(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 17:33:59

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 76m²	
Site Reference :	Maitland Park Estate	**Plot Reference:**	GT 403
Address :	GT 403, 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)	23.91 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	7.12 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.0 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	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: East	1.5m²	
Windows facing: East	9.95m²	
Windows facing: South	1.5m²	
Windows facing: East	1.5m²	
Windows facing: South	5.34m²	
Windows facing: South	2.24m²	
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: GT 403

Address : GT 403, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76	(1a) x	2.6	(2a) =	197.6	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	197.6	(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

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			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 2			9.95	x1/[1/(1.4)+ 0.04]	=	13.19			(27)
Windows Type 3			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 4			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 5			5.34	x1/[1/(1.4)+ 0.04]	=	7.08			(27)
Windows Type 6			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Walls	48.18	22.03	26.15	x 0.12	=	3.14			(29)
Roof	76	0	76	x 0.1	=	7.6			(30)
Total area of elements, m²			124.18						(31)
Party wall			48.28	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) = 39.94 (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) = 49.55 (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

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(38)m=	14.73	14.59	14.45	13.76	13.62	12.93	12.93	12.79	13.2	13.62	13.9	14.17	(38)

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

(39)m=	64.28	64.14	64	63.31	63.17	62.48	62.48	62.34	62.76	63.17	63.45	63.73	

Average = Sum(39)$_{1…12}$ /12= 63.28 (39)

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

(40)m=	0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.82	0.83	0.83	0.83	0.84	

Average = Sum(40)$_{1…12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (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 90.79 (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=	99.87	96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87

Total = Sum(44)$_{1…12}$ = 1089.44 (44)

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

(45)m=	148.1	129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42

Total = Sum(45)$_{1…12}$ = 1428.42 (45)

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

(46)m=	22.21	19.43	20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51	(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)

DER WorkSheet: New dwelling design stage

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=	203.37	179.45	188.94	170.02	167.09	149.98	144.68	157.87	157.32	176.27	185.57	198.7	(62)

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

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

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

Output from water heater

(64)m=	203.37	179.45	188.94	170.02	167.09	149.98	144.68	157.87	157.32	176.27	185.57	198.7

Output from water heater (annual)$_{1...12}$ | 2079.26 | (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=	93.46	83.01	88.66	81.54	81.4	74.88	73.95	78.33	77.32	84.45	86.71	91.91	(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=	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18.8	16.7	13.58	10.28	7.68	6.49	7.01	9.11	12.23	15.53	18.13	19.32	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	210.88	213.07	207.55	195.81	180.99	167.07	157.76	155.57	161.09	172.83	187.65	201.57	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	(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=	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	(71)
Water heating gains (Table 5)													
(72)m=	125.62	123.53	119.17	113.25	109.41	103.99	99.39	105.29	107.38	113.51	120.43	123.53	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	414.04	412.03	399.04	378.08	356.82	336.29	322.91	328.71	339.44	360.61	384.94	403.17	(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	1.5	x	19.64	x	0.4	x	0.8	=	6.53	(76)
East	0.9x	0.77	x	9.95	x	19.64	x	0.4	x	0.8	=	43.34	(76)

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East	0.9x	0.77	x	1.5	x	19.64	x	0.4	x	0.8	=	6.53	(76)
East	0.9x	0.77	x	1.5	x	38.42	x	0.4	x	0.8	=	12.78	(76)
East	0.9x	0.77	x	9.95	x	38.42	x	0.4	x	0.8	=	84.78	(76)
East	0.9x	0.77	x	1.5	x	38.42	x	0.4	x	0.8	=	12.78	(76)
East	0.9x	0.77	x	1.5	x	63.27	x	0.4	x	0.8	=	21.05	(76)
East	0.9x	0.77	x	9.95	x	63.27	x	0.4	x	0.8	=	139.61	(76)
East	0.9x	0.77	x	1.5	x	63.27	x	0.4	x	0.8	=	21.05	(76)
East	0.9x	0.77	x	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(76)
East	0.9x	0.77	x	9.95	x	92.28	x	0.4	x	0.8	=	203.62	(76)
East	0.9x	0.77	x	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(76)
East	0.9x	0.77	x	1.5	x	113.09	x	0.4	x	0.8	=	37.62	(76)
East	0.9x	0.77	x	9.95	x	113.09	x	0.4	x	0.8	=	249.54	(76)
East	0.9x	0.77	x	1.5	x	113.09	x	0.4	x	0.8	=	37.62	(76)
East	0.9x	0.77	x	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	x	9.95	x	115.77	x	0.4	x	0.8	=	255.45	(76)
East	0.9x	0.77	x	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	x	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(76)
East	0.9x	0.77	x	9.95	x	110.22	x	0.4	x	0.8	=	243.2	(76)
East	0.9x	0.77	x	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(76)
East	0.9x	0.77	x	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(76)
East	0.9x	0.77	x	9.95	x	94.68	x	0.4	x	0.8	=	208.9	(76)
East	0.9x	0.77	x	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(76)
East	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(76)
East	0.9x	0.77	x	9.95	x	73.59	x	0.4	x	0.8	=	162.38	(76)
East	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(76)
East	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(76)
East	0.9x	0.77	x	9.95	x	45.59	x	0.4	x	0.8	=	100.59	(76)
East	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(76)
East	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(76)
East	0.9x	0.77	x	9.95	x	24.49	x	0.4	x	0.8	=	54.04	(76)
East	0.9x	0.77	x	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(76)
East	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	=	5.37	(76)
East	0.9x	0.77	x	9.95	x	16.15	x	0.4	x	0.8	=	35.64	(76)
East	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	=	5.37	(76)
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	5.34	x	46.75	x	0.4	x	0.8	=	55.36	(78)
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	76.57	x	0.4	x	0.8	=	25.47	(78)
South	0.9x	0.77	x	5.34	x	76.57	x	0.4	x	0.8	=	90.67	(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	97.53	x	0.4	x	0.8	=	32.44	(78)

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South	0.9x	0.77	x	5.34	x	97.53	x	0.4	x	0.8	=	115.5	(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	110.23	x	0.4	x	0.8	=	36.67	(78)
South	0.9x	0.77	x	5.34	x	110.23	x	0.4	x	0.8	=	130.54	(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	114.87	x	0.4	x	0.8	=	38.21	(78)
South	0.9x	0.77	x	5.34	x	114.87	x	0.4	x	0.8	=	136.03	(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	110.55	x	0.4	x	0.8	=	36.77	(78)
South	0.9x	0.77	x	5.34	x	110.55	x	0.4	x	0.8	=	130.91	(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	108.01	x	0.4	x	0.8	=	35.93	(78)
South	0.9x	0.77	x	5.34	x	108.01	x	0.4	x	0.8	=	127.91	(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	104.89	x	0.4	x	0.8	=	34.89	(78)
South	0.9x	0.77	x	5.34	x	104.89	x	0.4	x	0.8	=	124.22	(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	101.89	x	0.4	x	0.8	=	33.89	(78)
South	0.9x	0.77	x	5.34	x	101.89	x	0.4	x	0.8	=	120.65	(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	82.59	x	0.4	x	0.8	=	27.47	(78)
South	0.9x	0.77	x	5.34	x	82.59	x	0.4	x	0.8	=	97.8	(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	55.42	x	0.4	x	0.8	=	18.43	(78)
South	0.9x	0.77	x	5.34	x	55.42	x	0.4	x	0.8	=	65.62	(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	40.4	x	0.4	x	0.8	=	13.44	(78)
South	0.9x	0.77	x	5.34	x	40.4	x	0.4	x	0.8	=	47.84	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.4	x	0.8	=	20.07	(78)

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

(83)m=	150.54	264.51	378.1	486.98	556.08	555.07	534.01	483.1	416.49	297.22	181.91	127.73	(83)

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

(84)m=	564.58	676.54	777.14	865.06	912.91	891.35	856.92	811.82	755.93	657.82	566.85	530.9	(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	0.81	0.63	0.45	0.32	0.35	0.57	0.87	0.98	0.99	(86)

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

(87)m=	20.33	20.51	20.73	20.91	20.98	21	21	21	20.99	20.89	20.57	20.29	(87)

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

(88)m=	20.21	20.22	20.22	20.22	20.23	20.23	20.23	20.24	20.23	20.23	20.22	20.22	(88)

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

(89)m=	0.99	0.97	0.91	0.77	0.58	0.39	0.26	0.29	0.51	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=	19.33	19.59	19.89	20.13	20.21	20.23	20.23	20.24	20.23	20.11	19.68	19.27	(90)

fLA = Living area ÷ (4) = 0.36 (91)

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

(92)m=	19.69	19.92	20.2	20.42	20.49	20.51	20.51	20.51	20.5	20.39	20	19.64	(92)

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

(93)m=	19.69	19.92	20.2	20.42	20.49	20.51	20.51	20.51	20.5	20.39	20	19.64	(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	0.78	0.6	0.41	0.29	0.32	0.53	0.84	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	558.06	654.66	709.33	677.57	546.84	368.58	244.26	256.21	398.93	552.31	550.09	526.48	(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=	989.07	963.63	876.6	729.02	555.34	369.2	244.31	256.29	401.85	618.4	818.71	983.89	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	320.68	207.63	124.45	37.05	6.33	0	0	0	0	49.17	193.41	340.31	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1279.01 (98)

Space heating requirement in kWh/m²/year 16.83 (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		1279.01	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1406.91	(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		2079.26	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2287.19	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	36.94	(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		159.71	(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) =	159.71	(331)
Energy for lighting (calculated in Appendix L)		332.01	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-644.26	(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	=	601.02	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	19.17	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	620.19	(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) =				620.19	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	82.89	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	172.31	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =		-334.37	(380)
Total CO2, kg/year	sum of (376)…(382) =				541.02	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				7.12	(384)
EI rating (section 14)					94.01	(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: GT 403

Address : GT 403, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76	(1a) x	2.6	(2a) =	197.6	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	197.6	(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

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

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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	0.32	0.32	0.32	0.34	0.37	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			1.29	x1/[1/(1.4)+ 0.04]	=	1.71			(27)
Windows Type 2			8.58	x1/[1/(1.4)+ 0.04]	=	11.37			(27)
Windows Type 3			1.29	x1/[1/(1.4)+ 0.04]	=	1.71			(27)
Windows Type 4			1.29	x1/[1/(1.4)+ 0.04]	=	1.71			(27)
Windows Type 5			4.61	x1/[1/(1.4)+ 0.04]	=	6.11			(27)
Windows Type 6			1.93	x1/[1/(1.4)+ 0.04]	=	2.56			(27)
Walls	48.18	18.99	29.19	x 0.18	=	5.25			(29)
Roof	76	0	76	x 0.13	=	9.88			(30)
Total area of elements, m²			124.18						(31)
Party wall			48.28	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) = 40.31 (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 6.99 (36)

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

Total fabric heat loss (33) + (36) = 47.3 (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=	38.79	38.55	38.31	37.21	37	36.04	36.04	35.86	36.41	37	37.42	37.86	(38)

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

(39)m=	86.09	85.85	85.61	84.51	84.3	83.34	83.34	83.16	83.71	84.3	84.72	85.16

Average = $Sum(39)_{1...12}$ /12= 84.51 (39)

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

(40)m=	1.13	1.13	1.13	1.11	1.11	1.1	1.1	1.09	1.1	1.11	1.11	1.12

Average = $Sum(40)_{1...12}$ /12= 1.11 (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 2.38 (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 90.79 (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=	99.87	96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87

Total = $Sum(44)_{1...12}$ = 1089.44 (44)

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

(45)m=	148.1	129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42

Total = $Sum(45)_{1...12}$ = 1428.42 (45)

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

(46)m=	22.21	19.43	20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51	(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=	194.69	171.61	180.25	161.62	158.41	141.58	136	149.19	148.91	167.59	177.17	190.02	(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=	194.69	171.61	180.25	161.62	158.41	141.58	136	149.19	148.91	167.59	177.17	190.02

Output from water heater (annual)$_{1...12}$ — 1977.04 (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=	86.52	76.74	81.72	74.82	74.45	68.15	67	71.39	70.59	77.51	79.99	84.96	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	119.13	(66)

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

(67)m=	18.8	16.7	13.58	10.28	7.68	6.49	7.01	9.11	12.23	15.53	18.13	19.32	(67)

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

(68)m=	210.88	213.07	207.55	195.81	180.99	167.07	157.76	155.57	161.09	172.83	187.65	201.57	(68)

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

(69)m=	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	-95.3	(71)

Water heating gains (Table 5)

(72)m=	116.29	114.19	109.84	103.92	100.07	94.66	90.06	95.95	98.05	104.18	111.09	114.2	(72)

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

(73)m=	407.7	405.69	392.71	371.75	350.49	329.95	316.57	322.38	333.1	354.27	378.61	396.83	(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	1.29	x	19.64	x	0.63	x	0.7	=	7.74	(76)
East	0.9x	0.77	x	8.58	x	19.64	x	0.63	x	0.7	=	51.5	(76)

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East	0.9x	0.77	x	1.29	x	19.64	x	0.63	x	0.7	=	7.74	(76)
East	0.9x	0.77	x	1.29	x	38.42	x	0.63	x	0.7	=	15.15	(76)
East	0.9x	0.77	x	8.58	x	38.42	x	0.63	x	0.7	=	100.74	(76)
East	0.9x	0.77	x	1.29	x	38.42	x	0.63	x	0.7	=	15.15	(76)
East	0.9x	0.77	x	1.29	x	63.27	x	0.63	x	0.7	=	24.94	(76)
East	0.9x	0.77	x	8.58	x	63.27	x	0.63	x	0.7	=	165.91	(76)
East	0.9x	0.77	x	1.29	x	63.27	x	0.63	x	0.7	=	24.94	(76)
East	0.9x	0.77	x	1.29	x	92.28	x	0.63	x	0.7	=	36.38	(76)
East	0.9x	0.77	x	8.58	x	92.28	x	0.63	x	0.7	=	241.97	(76)
East	0.9x	0.77	x	1.29	x	92.28	x	0.63	x	0.7	=	36.38	(76)
East	0.9x	0.77	x	1.29	x	113.09	x	0.63	x	0.7	=	44.59	(76)
East	0.9x	0.77	x	8.58	x	113.09	x	0.63	x	0.7	=	296.55	(76)
East	0.9x	0.77	x	1.29	x	113.09	x	0.63	x	0.7	=	44.59	(76)
East	0.9x	0.77	x	1.29	x	115.77	x	0.63	x	0.7	=	45.64	(76)
East	0.9x	0.77	x	8.58	x	115.77	x	0.63	x	0.7	=	303.57	(76)
East	0.9x	0.77	x	1.29	x	115.77	x	0.63	x	0.7	=	45.64	(76)
East	0.9x	0.77	x	1.29	x	110.22	x	0.63	x	0.7	=	43.45	(76)
East	0.9x	0.77	x	8.58	x	110.22	x	0.63	x	0.7	=	289.01	(76)
East	0.9x	0.77	x	1.29	x	110.22	x	0.63	x	0.7	=	43.45	(76)
East	0.9x	0.77	x	1.29	x	94.68	x	0.63	x	0.7	=	37.33	(76)
East	0.9x	0.77	x	8.58	x	94.68	x	0.63	x	0.7	=	248.26	(76)
East	0.9x	0.77	x	1.29	x	94.68	x	0.63	x	0.7	=	37.33	(76)
East	0.9x	0.77	x	1.29	x	73.59	x	0.63	x	0.7	=	29.01	(76)
East	0.9x	0.77	x	8.58	x	73.59	x	0.63	x	0.7	=	192.96	(76)
East	0.9x	0.77	x	1.29	x	73.59	x	0.63	x	0.7	=	29.01	(76)
East	0.9x	0.77	x	1.29	x	45.59	x	0.63	x	0.7	=	17.97	(76)
East	0.9x	0.77	x	8.58	x	45.59	x	0.63	x	0.7	=	119.54	(76)
East	0.9x	0.77	x	1.29	x	45.59	x	0.63	x	0.7	=	17.97	(76)
East	0.9x	0.77	x	1.29	x	24.49	x	0.63	x	0.7	=	9.65	(76)
East	0.9x	0.77	x	8.58	x	24.49	x	0.63	x	0.7	=	64.21	(76)
East	0.9x	0.77	x	1.29	x	24.49	x	0.63	x	0.7	=	9.65	(76)
East	0.9x	0.77	x	1.29	x	16.15	x	0.63	x	0.7	=	6.37	(76)
East	0.9x	0.77	x	8.58	x	16.15	x	0.63	x	0.7	=	42.35	(76)
East	0.9x	0.77	x	1.29	x	16.15	x	0.63	x	0.7	=	6.37	(76)
South	0.9x	0.77	x	1.29	x	46.75	x	0.63	x	0.7	=	18.43	(78)
South	0.9x	0.77	x	4.61	x	46.75	x	0.63	x	0.7	=	65.87	(78)
South	0.9x	0.77	x	1.93	x	46.75	x	0.63	x	0.7	=	27.58	(78)
South	0.9x	0.77	x	1.29	x	76.57	x	0.63	x	0.7	=	30.19	(78)
South	0.9x	0.77	x	4.61	x	76.57	x	0.63	x	0.7	=	107.87	(78)
South	0.9x	0.77	x	1.93	x	76.57	x	0.63	x	0.7	=	45.16	(78)
South	0.9x	0.77	x	1.29	x	97.53	x	0.63	x	0.7	=	38.45	(78)

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South	0.9x	0.77	x	4.61	x	97.53	x	0.63	x	0.7	=	137.41	(78)
South	0.9x	0.77	x	1.93	x	97.53	x	0.63	x	0.7	=	57.53	(78)
South	0.9x	0.77	x	1.29	x	110.23	x	0.63	x	0.7	=	43.46	(78)
South	0.9x	0.77	x	4.61	x	110.23	x	0.63	x	0.7	=	155.31	(78)
South	0.9x	0.77	x	1.93	x	110.23	x	0.63	x	0.7	=	65.02	(78)
South	0.9x	0.77	x	1.29	x	114.87	x	0.63	x	0.7	=	45.29	(78)
South	0.9x	0.77	x	4.61	x	114.87	x	0.63	x	0.7	=	161.84	(78)
South	0.9x	0.77	x	1.93	x	114.87	x	0.63	x	0.7	=	67.75	(78)
South	0.9x	0.77	x	1.29	x	110.55	x	0.63	x	0.7	=	43.58	(78)
South	0.9x	0.77	x	4.61	x	110.55	x	0.63	x	0.7	=	155.75	(78)
South	0.9x	0.77	x	1.93	x	110.55	x	0.63	x	0.7	=	65.2	(78)
South	0.9x	0.77	x	1.29	x	108.01	x	0.63	x	0.7	=	42.58	(78)
South	0.9x	0.77	x	4.61	x	108.01	x	0.63	x	0.7	=	152.18	(78)
South	0.9x	0.77	x	1.93	x	108.01	x	0.63	x	0.7	=	63.71	(78)
South	0.9x	0.77	x	1.29	x	104.89	x	0.63	x	0.7	=	41.35	(78)
South	0.9x	0.77	x	4.61	x	104.89	x	0.63	x	0.7	=	147.78	(78)
South	0.9x	0.77	x	1.93	x	104.89	x	0.63	x	0.7	=	61.87	(78)
South	0.9x	0.77	x	1.29	x	101.89	x	0.63	x	0.7	=	40.17	(78)
South	0.9x	0.77	x	4.61	x	101.89	x	0.63	x	0.7	=	143.54	(78)
South	0.9x	0.77	x	1.93	x	101.89	x	0.63	x	0.7	=	60.1	(78)
South	0.9x	0.77	x	1.29	x	82.59	x	0.63	x	0.7	=	32.56	(78)
South	0.9x	0.77	x	4.61	x	82.59	x	0.63	x	0.7	=	116.35	(78)
South	0.9x	0.77	x	1.93	x	82.59	x	0.63	x	0.7	=	48.71	(78)
South	0.9x	0.77	x	1.29	x	55.42	x	0.63	x	0.7	=	21.85	(78)
South	0.9x	0.77	x	4.61	x	55.42	x	0.63	x	0.7	=	78.08	(78)
South	0.9x	0.77	x	1.93	x	55.42	x	0.63	x	0.7	=	32.69	(78)
South	0.9x	0.77	x	1.29	x	40.4	x	0.63	x	0.7	=	15.93	(78)
South	0.9x	0.77	x	4.61	x	40.4	x	0.63	x	0.7	=	56.92	(78)
South	0.9x	0.77	x	1.93	x	40.4	x	0.63	x	0.7	=	23.83	(78)

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

(83)m=	178.86	314.26	449.2	578.52	660.6	659.39	634.38	573.91	494.79	353.11	216.13	151.76	(83)

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

(84)m=	586.57	719.96	841.9	950.27	1011.09	989.34	950.95	896.29	827.9	707.38	594.74	548.59	(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	0.98	0.95	0.87	0.72	0.53	0.38	0.42	0.66	0.91	0.99	1	(86)

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

(87)m=	19.94	20.16	20.45	20.75	20.93	20.99	21	21	20.96	20.71	20.26	19.9	(87)

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

(88)m=	19.97	19.98	19.98	19.99	19.99	20	20	20.01	20	19.99	19.99	19.98	(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	0.83	0.66	0.45	0.3	0.33	0.58	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=	18.58	18.9	19.32	19.72	19.93	20	20	20	19.97	19.69	19.06	18.53	(90)

fLA = Living area ÷ (4) = 0.36 (91)

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

(92)m=	19.07	19.36	19.73	20.09	20.29	20.35	20.36	20.36	20.33	20.06	19.49	19.02	(92)

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

(93)m=	19.07	19.36	19.73	20.09	20.29	20.35	20.36	20.36	20.33	20.06	19.49	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	0.97	0.93	0.84	0.67	0.48	0.33	0.37	0.61	0.88	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	580.34	700.43	785.11	794.31	682.14	473.81	312.86	328.38	503.06	625.1	580.53	544.26	(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=	1271.6	1241.16	1132.29	946.04	723.98	479.5	313.5	329.5	521.54	797.19	1050.09	1262.43	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	514.3	363.37	258.3	109.25	31.13	0	0	0	0	128.03	338.08	534.32	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2276.77 (98)

Space heating requirement in kWh/m²/year 29.96 (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)													
	514.3	363.37	258.3	109.25	31.13	0	0	0	0	128.03	338.08	534.32	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	550.05	388.63	276.25	116.84	33.29	0	0	0	0	136.93	361.58	571.46	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2435.04 (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)

194.69	171.61	180.25	161.62	158.41	141.58	136	149.19	148.91	167.59	177.17	190.02

Efficiency of water heater 79.8 (216)

(217)m=	87.29	86.77	85.77	83.8	81.38	79.8	79.8	79.8	79.8	84.11	86.51	87.42	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	223.05	197.78	210.15	192.87	194.65	177.41	170.43	186.96	186.61	199.26	204.79	217.35

Total = Sum(219a)$_{1...12}$ = 2361.31 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2435.04	
Water heating fuel used			2361.31	
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			332.01	(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	=	525.97	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	510.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1036.01	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	172.31	(268)
Total CO2, kg/year		sum of (265)…(271) =		1247.25	(272)

TER = 23.91 (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 17:34:22

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 57m²

Site Reference : Maitland Park Estate **Plot Reference:** GT 404

Address : GT 404, 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)	29.13 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	8.62 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	43.0 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	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:	0.5	
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	1.5m²
Windows facing: North	2.24m²
Windows facing: North	1.5m²
Windows facing: North	6.73m²
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: GT 404

Address : GT 404, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	57	(1a) x	2.6	(2a) =	148.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	57	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		148.2	(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			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 3			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Windows Type 4			6.73	x1/[1/(1.4)+ 0.04]		=	8.92			(27)
Walls	50.8	11.97	38.83	x	0.12	=	4.66			(29)
Roof	57	0	57	x	0.1	=	5.7			(30)
Total area of elements, m²			107.8							(31)
Party wall			28.34	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) = 26.23 (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 7.64 (36)

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

Total fabric heat loss (33) + (36) = 33.87 (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=	11.05	10.94	10.84	10.32	10.22	9.7	9.7	9.59	9.9	10.22	10.42	10.63	(38)

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

(39)m=	44.92	44.81	44.71	44.19	44.09	43.57	43.57	43.46	43.77	44.09	44.29	44.5	

Average = Sum(39)$_{1…12}$ /12= 44.16 (39)

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

(40)m=	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.76	0.77	0.77	0.78	0.78

Average = Sum(40)$_{1…12}$ /12= 0.77 (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 — 1.9 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 79.22 (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=	87.14	83.98	80.81	77.64	74.47	71.3	71.3	74.47	77.64	80.81	83.98	87.14

Total = Sum(44)$_{1…12}$ = 950.67 (44)

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

(45)m=	129.23	113.03	116.63	101.68	97.57	84.19	78.02	89.53	90.6	105.58	115.25	125.15

Total = Sum(45)$_{1…12}$ = 1246.47 (45)

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

(46)m=	19.38	16.95	17.5	15.25	14.64	12.63	11.7	13.43	13.59	15.84	17.29	18.77	(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=	184.51	162.96	171.91	155.18	152.85	137.69	133.3	144.8	144.09	160.86	168.74	180.43	(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=	184.51	162.96	171.91	155.18	152.85	137.69	133.3	144.8	144.09	160.86	168.74	180.43

Output from water heater (annual)$_{1...12}$ 1897.31 (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=	87.19	77.52	83	76.61	76.66	70.79	70.16	73.99	72.92	79.33	81.12	85.84	(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=	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	(66)

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

(67)m=	14.74	13.09	10.65	8.06	6.02	5.09	5.5	7.14	9.59	12.17	14.21	15.15	(67)

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

(68)m=	165.32	167.04	162.72	153.51	141.89	130.98	123.68	121.97	126.29	135.49	147.11	158.03	(68)

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

(69)m=	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	(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=	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	(71)

Water heating gains (Table 5)

(72)m=	117.19	115.36	111.56	106.4	103.04	98.32	94.3	99.45	101.28	106.62	112.66	115.37	(72)

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

(73)m=	348.69	346.93	336.36	319.4	302.4	285.82	274.92	279.99	288.59	305.72	325.42	339.98	(73)

6. Solar gains:

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

Orientation:		Access Factor Table 6d		Area 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	1.5	x	10.63	x	0.4	x	0.8	=	3.54	(74)
North	0.9x	0.77	x	6.73	x	10.63	x	0.4	x	0.8	=	15.87	(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	1.5	x	20.32	x	0.4	x	0.8	=	6.76	(74)

North	0.9x	0.77	x	6.73	x	20.32	x	0.4	x	0.8	=	30.33	(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	1.5	x	34.53	x	0.4	x	0.8	=	11.49	(74)
North	0.9x	0.77	x	6.73	x	34.53	x	0.4	x	0.8	=	51.53	(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	1.5	x	55.46	x	0.4	x	0.8	=	18.45	(74)
North	0.9x	0.77	x	6.73	x	55.46	x	0.4	x	0.8	=	82.78	(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	1.5	x	74.72	x	0.4	x	0.8	=	24.85	(74)
North	0.9x	0.77	x	6.73	x	74.72	x	0.4	x	0.8	=	111.51	(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	1.5	x	79.99	x	0.4	x	0.8	=	26.61	(74)
North	0.9x	0.77	x	6.73	x	79.99	x	0.4	x	0.8	=	119.37	(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	1.5	x	74.68	x	0.4	x	0.8	=	24.84	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.4	x	0.8	=	111.45	(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	1.5	x	59.25	x	0.4	x	0.8	=	19.71	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.4	x	0.8	=	88.42	(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	1.5	x	41.52	x	0.4	x	0.8	=	13.81	(74)
North	0.9x	0.77	x	6.73	x	41.52	x	0.4	x	0.8	=	61.96	(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	1.5	x	24.19	x	0.4	x	0.8	=	8.05	(74)
North	0.9x	0.77	x	6.73	x	24.19	x	0.4	x	0.8	=	36.1	(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	1.5	x	13.12	x	0.4	x	0.8	=	4.36	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.4	x	0.8	=	19.58	(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	1.5	x	8.86	x	0.4	x	0.8	=	2.95	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.4	x	0.8	=	13.23	(74)
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	1.5	x	76.57	x	0.4	x	0.8	=	25.47	(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	1.5	x	110.23	x	0.4	x	0.8	=	36.67	(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	1.5	x	110.55	x	0.4	x	0.8	=	36.77	(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	1.5	x	104.89	x	0.4	x	0.8	=	34.89	(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	1.5	x	82.59	x	0.4	x	0.8	=	27.47	(78)

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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	1.5	x	40.4	x	0.4	x	0.8	=	13.44	(78)

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

(83)m=	40.24	72.65	112.62	165.45	211.69	222.48	209.32	172.45	130.29	83.63	48.89	34.02	(83)

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

(84)m=	388.93	419.58	448.98	484.85	514.08	508.3	484.23	452.44	418.87	389.36	374.31	374	(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	0.76	0.54	0.4	0.44	0.7	0.93	0.99	1	(86)

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

(87)m=	20.36	20.46	20.63	20.84	20.96	21	21	21	20.98	20.83	20.57	20.34	(87)

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

(88)m=	20.26	20.27	20.27	20.27	20.28	20.28	20.28	20.29	20.28	20.28	20.27	20.27	(88)

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

(89)m=	0.99	0.99	0.97	0.89	0.71	0.49	0.33	0.37	0.64	0.91	0.98	0.99	(89)

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

(90)m=	19.41	19.56	19.8	20.09	20.24	20.28	20.28	20.29	20.27	20.09	19.72	19.38	(90)

fLA = Living area ÷ (4) = 0.56 (91)

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

(92)m=	19.94	20.06	20.26	20.51	20.64	20.68	20.68	20.68	20.67	20.5	20.19	19.91	(92)

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

(93)m=	19.94	20.06	20.26	20.51	20.64	20.68	20.68	20.68	20.67	20.5	20.19	19.91	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.97	0.9	0.74	0.52	0.37	0.41	0.67	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	385.92	413.64	433.93	435.25	377.93	263.58	177.75	185.93	280.73	357.76	367.78	371.71	(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=	702.39	679.3	615.17	512.85	394.3	264.87	177.84	186.13	287.45	436.57	579.71	699.27	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	235.46	178.53	134.84	55.87	12.18	0	0	0	0	58.63	152.59	243.7	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1071.8 (98)

Space heating requirement in kWh/m²/year 18.8 (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		1071.8	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1178.98	(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		1897.31	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2087.04	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.66	(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		113	(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) =	113	(331)
Energy for lighting (calculated in Appendix L)		260.29	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-482.76	(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	=	531.37	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.95	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	548.32	(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) =			548.32	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	58.65	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	135.09	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-250.55	(380)
Total CO2, kg/year	sum of (376)…(382) =			491.5	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			8.62	(384)
EI rating (section 14)				93.54	(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: GT 404

Address : GT 404, Aspen Court, Maitland Park Estate, London, NW3 2EH

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	57	(1a) x	2.6	(2a) =	148.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	57	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	148.2	(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) =	0.33	(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	0.4	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	
Windows Type 1			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 2			2.24	x1/[1/(1.4)+ 0.04]	=	2.97			(27)
Windows Type 3			1.5	x1/[1/(1.4)+ 0.04]	=	1.99			(27)
Windows Type 4			6.73	x1/[1/(1.4)+ 0.04]	=	8.92			(27)
Walls	50.8	11.97	38.83	x 0.18	=	6.99			(29)
Roof	57	0	57	x 0.13	=	7.41			(30)
Total area of elements, m²			107.8						(31)
Party wall			28.34	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) = 30.27 (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 5.92 (36)

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

Total fabric heat loss (33) + (36) = 36.18 (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=	28.71	28.54	28.38	27.62	27.48	26.82	26.82	26.69	27.07	27.48	27.77	28.07	(38)

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

(39)m=	64.89	64.73	64.57	63.81	63.66	63	63	62.88	63.26	63.66	63.95	64.25	

Average = Sum(39)$_{1…12}$ /12= 63.81 (39)

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

(40)m=	1.14	1.14	1.13	1.12	1.12	1.11	1.11	1.1	1.11	1.12	1.12	1.13

Average = Sum(40)$_{1…12}$ /12= 1.12 (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 1.9 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 79.22 (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=	87.14	83.98	80.81	77.64	74.47	71.3	71.3	74.47	77.64	80.81	83.98	87.14	
										Total = Sum(44)$_{1…12}$ =		950.67	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)													
(45)m=	129.23	113.03	116.63	101.68	97.57	84.19	78.02	89.53	90.6	105.58	115.25	125.15	
										Total = Sum(45)$_{1…12}$ =		1246.47	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	19.38	16.95	17.5	15.25	14.64	12.63	11.7	13.43	13.59	15.84	17.29	18.77	(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=	175.83	155.11	163.23	146.78	144.16	129.29	124.61	136.12	135.69	152.18	160.34	171.75	(62)

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

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

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

Output from water heater

(64)m=	175.83	155.11	163.23	146.78	144.16	129.29	124.61	136.12	135.69	152.18	160.34	171.75	

Output from water heater (annual)$_{1...12}$ 1795.09 (64)

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

(65)m=	80.25	71.25	76.06	69.88	69.72	64.07	63.22	67.04	66.2	72.38	74.39	78.89	(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=	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	(66)

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

(67)m=	14.78	13.13	10.68	8.08	6.04	5.1	5.51	7.16	9.61	12.21	14.25	15.19	(67)

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

(68)m=	165.32	167.04	162.72	153.51	141.89	130.98	123.68	121.97	126.29	135.49	147.11	158.03	(68)

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

(69)m=	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	(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=	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.83	(71)

Water heating gains (Table 5)

(72)m=	107.86	106.03	102.23	97.06	93.71	88.98	84.97	90.11	91.94	97.29	103.33	106.03	(72)

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

(73)m=	342.39	340.63	330.05	313.09	296.08	279.49	268.6	273.68	282.28	299.42	319.12	333.69	(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	0.63	x	0.7	=	7.28	(74)
North	0.9x	0.77	x	1.5	x	10.63	x	0.63	x	0.7	=	4.87	(74)
North	0.9x	0.77	x	6.73	x	10.63	x	0.63	x	0.7	=	21.87	(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	1.5	x	20.32	x	0.63	x	0.7	=	9.32	(74)

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North	0.9x	0.77	x	6.73	x	20.32	x	0.63	x	0.7	=	41.8	(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	1.5	x	34.53	x	0.63	x	0.7	=	15.83	(74)
North	0.9x	0.77	x	6.73	x	34.53	x	0.63	x	0.7	=	71.02	(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	1.5	x	55.46	x	0.63	x	0.7	=	25.43	(74)
North	0.9x	0.77	x	6.73	x	55.46	x	0.63	x	0.7	=	114.08	(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	1.5	x	74.72	x	0.63	x	0.7	=	34.25	(74)
North	0.9x	0.77	x	6.73	x	74.72	x	0.63	x	0.7	=	153.67	(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	1.5	x	79.99	x	0.63	x	0.7	=	36.67	(74)
North	0.9x	0.77	x	6.73	x	79.99	x	0.63	x	0.7	=	164.51	(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	1.5	x	74.68	x	0.63	x	0.7	=	34.23	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.63	x	0.7	=	153.59	(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	1.5	x	59.25	x	0.63	x	0.7	=	27.16	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.63	x	0.7	=	121.86	(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	1.5	x	41.52	x	0.63	x	0.7	=	19.03	(74)
North	0.9x	0.77	x	6.73	x	41.52	x	0.63	x	0.7	=	85.39	(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	1.5	x	24.19	x	0.63	x	0.7	=	11.09	(74)
North	0.9x	0.77	x	6.73	x	24.19	x	0.63	x	0.7	=	49.75	(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	1.5	x	13.12	x	0.63	x	0.7	=	6.01	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.63	x	0.7	=	26.98	(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	1.5	x	8.86	x	0.63	x	0.7	=	4.06	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.63	x	0.7	=	18.23	(74)
South	0.9x	0.77	x	1.5	x	46.75	x	0.63	x	0.7	=	21.43	(78)
South	0.9x	0.77	x	1.5	x	76.57	x	0.63	x	0.7	=	35.1	(78)
South	0.9x	0.77	x	1.5	x	97.53	x	0.63	x	0.7	=	44.71	(78)
South	0.9x	0.77	x	1.5	x	110.23	x	0.63	x	0.7	=	50.53	(78)
South	0.9x	0.77	x	1.5	x	114.87	x	0.63	x	0.7	=	52.66	(78)
South	0.9x	0.77	x	1.5	x	110.55	x	0.63	x	0.7	=	50.68	(78)
South	0.9x	0.77	x	1.5	x	108.01	x	0.63	x	0.7	=	49.51	(78)
South	0.9x	0.77	x	1.5	x	104.89	x	0.63	x	0.7	=	48.09	(78)
South	0.9x	0.77	x	1.5	x	101.89	x	0.63	x	0.7	=	46.71	(78)
South	0.9x	0.77	x	1.5	x	82.59	x	0.63	x	0.7	=	37.86	(78)

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South	0.9x	0.77	x	1.5	x	55.42	x	0.63	x	0.7	=	25.4	(78)
South	0.9x	0.77	x	1.5	x	40.4	x	0.63	x	0.7	=	18.52	(78)

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

(83)m=	55.46	100.12	155.2	228.01	291.73	306.61	288.46	237.66	179.55	115.26	67.38	46.88	(83)

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

(84)m=	397.85	440.75	485.25	541.1	587.81	586.11	557.06	511.34	461.83	414.68	386.5	380.57	(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	0.98	0.95	0.84	0.65	0.49	0.55	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=	19.86	20	20.24	20.57	20.84	20.97	20.99	20.99	20.9	20.57	20.16	19.84	(87)

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

(88)m=	19.97	19.97	19.97	19.99	19.99	20	20	20	19.99	19.99	19.98	19.98	(88)

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

(89)m=	0.99	0.99	0.98	0.93	0.79	0.57	0.38	0.44	0.74	0.95	0.99	1	(89)

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

(90)m=	18.47	18.67	19.02	19.49	19.83	19.98	19.99	19.99	19.91	19.49	18.91	18.44	(90)

fLA = Living area ÷ (4) = 0.56 (91)

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

(92)m=	19.24	19.41	19.7	20.09	20.39	20.53	20.55	20.55	20.46	20.09	19.61	19.22	(92)

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

(93)m=	19.24	19.41	19.7	20.09	20.39	20.53	20.55	20.55	20.46	20.09	19.61	19.22	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.97	0.93	0.81	0.61	0.44	0.5	0.78	0.95	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	395.27	435.67	472.94	502.48	476.67	359.47	246.74	256.85	358.07	393.85	381.64	378.57	(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=	969.82	939.16	852.08	713.84	553.31	373.38	248.86	260.77	402.43	604.05	799.87	965.05	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	427.47	338.34	282.08	152.17	57.02	0	0	0	0	156.39	301.13	436.34	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 2150.93 (98)

Space heating requirement in kWh/m²/year 37.74 (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)	427.47	338.34	282.08	152.17	57.02	0	0	0	0	156.39	301.13	436.34		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	457.18	361.86	301.69	162.75	60.98	0	0	0	0	167.26	322.06	466.67		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2300.46	(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)	175.83	155.11	163.23	146.78	144.16	129.29	124.61	136.12	135.69	152.18	160.34	171.75		
Efficiency of water heater													79.8	(216)
(217)m=	87.1	86.84	86.26	84.91	82.57	79.8	79.8	79.8	79.8	84.89	86.47	87.2		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	201.88	178.62	189.23	172.86	174.6	162.01	156.16	170.58	170.04	179.27	185.43	196.97		
Total = Sum(219a)$_{1...12}$ =													2137.64	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2300.46	
Water heating fuel used			2137.64	
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			261	(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	=	496.9	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	461.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =				958.63	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	135.46	(268)

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Total CO_2, kg/year	sum of (265)…(271) =	1133.02	(272)
TER =		29.13	(273)